Clinical Topics

The neonatal surgeon*

R B ZACHARY

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During the presentation of the Denis Browne medal to Douglas Stephens reference was made to Denis Browne's definition of the role of the paediatric surgeon: "the aim of the paediatric surgeon is not to create a monopoly but to set a standard." Clearly Denis Browne was referring to current practice in Great Britain, since there are several countries in Europe in which most of the surgery of childhood is concentrated in the hands of paediatric surgeons, of whom there are very many. One has only to compare the number of paediatric surgeons in, for example, Poland with that in this country to appreciate the difference in approach.

If paediatric surgeons are to set such a standard they can do so only if they have more experience of the surgery of children than the general surgeon; if they accept their responsibilities for solving the problems involved in the work; and, in particular, if they pay attention to those aspects in which the surgery of childhood differs from the surgery of adults. The indications for operation in the various types of hernia, the management of childhood tumours, the timing and type of operation for undescended testis, are all examples in which the concentrated experience of the paediatric surgeon is an asset to management.

If we accept our duty to set a standard in the care of these surgical conditions in childhood we accept without question that most of this type of surgery will in fact be undertaken by general surgeons, and rightly so. To plan otherwise would mean to increase vastly the number of paediatric surgeons with no special advantage.

In contrast, my plea for neonatal surgery is that there should indeed be a monopoly, or near monopoly, in the hands of paediatric surgeons, most of whom will be dealing with a sufficient volume and variety of this work to justify the title of neonatal surgeons. In developing this line of thought it is appropriate to review briefly the number and range of neonatal surgical problems seen in the neonatal surgical ward of the paediatric surgical unit at the Sheffield Children's Hospital. I have reviewed critically the facilities available for this type of surgery in our unit to find out where we are failing and how we might improve the service.

The neonatal surgical ward

The ward was opened in March 1964. Before then neonates had been admitted to other wards, and it had been clear for several years that this was far from ideal. The new ward was one of four that were built immediately above the outpatient department, and it was intended to be a ward of limited access by the provision of double doors. We have never adopted a rule that all staff should put on overshoes and gowns before entering the inner doors.

There is one main room of five incubators or bassinettes, and one of three, which was intended to be a ward for special care but is no different from the rest. In addition there are seven single cubicles and a cooling-off room for three bassinettes—a room in which mothers can come to learn how to look after the infant before taking him home. The chief advantage of this layout is the good visibility from the nurses' station. We believe that the chief deficiencies in this ward arise from the absence of adequate monitoring equipment in the three-cot unit, but we have applied for funds to provide this.

When entering the wards we wear masks, realising that it does not provide a very effective barrier but hoping that it reminds the staff that they should adopt special care to prevent infection, mainly by washing their hands before touching a baby, and, secondly, by not leaning on the cot or incubator. We have not regularly monitored the infective contamination of the ward and its equipment, but this check is starting shortly.

The first 12 years

During the first 12 years of the neonatal surgical ward, from March 1964 to March 1976, 2848 infants were admitted. The total numbers admitted each year have fallen considerably in this time for three reasons. Firstly, other provision for neonatal surgery has been developed in Leeds and Nottingham; secondly, the number of cases of myelomeningocele has fallen dramatically; and, thirdly, there has been a considerable drop in the birth rate in the Sheffield area over the past few years.

In the early days about half the referrals were for abnormalities of the central nervous system (CNS), whereas in the past six years there were 382 cases of CNS anomalies among 1294 admissions (table I).

In the early days an abnormally high proportion of CNS cases came to our notice because we were known to have a special interest in this problem, but I have reviewed the rest of the cases to see whether they have given a sufficiently wide range of experience for consultants, for those in training, and for nurses. The distribution of cases among the various conditions is shown in table I. Among the conditions entered as miscellaneous there were, of course, a number that required operation, but some of the patients included had a provisional diagnosis of intestinal obstruction but were later found to have septicaemia or the immature bowel of the premature baby or some other unusual condition. Distinguishing these cases from those that

TABLE I—*Reasons for referral in 1294 infants admitted to the neonatal surgical ward in 1965-75*

	No of admissions		No of admissions
CNS anomalies	382	Respiratory disorders	44
Alimentary system disorders	424	Cardiovasculra disorders	38
Exomphalus	58	Miscellaneous	218
Urinary system disorders	50		
Hernia:	80		
Inguinal	46		
Diaphragmatic	29		
Hiatus	5		

*Based on the Forshall Lecture delivered at the XXIII Annual International Congress of Paediatric Surgeons on 9 July 1976.

Paediatric Surgical Unit, Children's Hospital, Sheffield S10 2TH
R B ZACHARY, FRCS, professor of paediatric surgery

TABLE II—*Conditions in infants admitted to neonatal surgical ward in 1969-75 with disorders of the alimentary system*

	No of admissions		No of admissions
Volvulus	22	Meconium ileus	23
Peritonitis	23	Hirschsprung's disease	13
Oesophageal atresia	92	Patent vitellor-intestinal duct	9
Imperforate anus	89	Extrinsic obstruction (bands)	40
Pyloric stenosis	56		
Small bowel obstruction	33		
Perforation of bowel	24		

require operation is an important part of the experience of the team. Our experience of alimentary tract problems is shown in table II, which contains some surprises. Hirschsprung's disease is now relatively more common.

Many premature babies were admitted to the ward, indicating the additional difficulties that have to be overcome in their care.

TEAMWORK

We have been fortunate that this total experience has been open to all members of the team, which consists of two consultants, a senior registrar and a registrar in paediatric surgery, and a senior house officer undertaking training in paediatric surgery, who spends two months out of every six attached to this ward.

We think it has been an important asset to the unit to avoid dividing the experience between the two consultants into watertight compartments. Although I and my colleague alternate weekly on emergency call and have the responsibility for the babies admitted when we are on duty, we always undertake joint rounds and can take active charge of our colleague's cases when he is away, rather than nominal charge, as is so often the case. We consider this to be extremely important, because there is no doubt that such a unit needs very close and personal supervision by each grade of staff.

Equally important is the nursing team; it is futile to embark on a programme of neonatal surgery without enough experienced nurses who will work in the unit for a considerable time. Our unit for 18 neonates is staffed by 17 people (not all full time), including three sisters and seven staff nurses. Half of them have been attached to the unit for more than two years.

The neonatal surgeon of the 1970s could not do justice to the cases coming under his care without the help of an anaesthetic team skilled in the techniques for children and especially for neonates. Although he needs the help of his anaesthetist colleagues during an operation, it is particularly in the early postoperative phase that the help will be most valuable, and it is a great relief for the surgeon to know that the anaesthetist can take over the problems of ventilation in these small babies. This places a heavy load on the shoulders of the consultant paediatric anaesthetist if one or two of his junior team do not have continuing responsibility for paediatric anaesthesia but are replaced by other juniors who are on call for the group.

Training in neonatal surgery

In our team the senior house officer is often an experienced surgeon from another country who has come to our unit specifically to gain experience in paediatric surgery in general, and neonatal surgery in particular. I commend them very much for being prepared to start right at the bottom, as I did when I first went to the Children's Hospital in Boston, USA, with about five years' experience of surgery and joined the team as the lowest form of animal life—namely, "surgical pup." My responsibilities were to test all the urine specimens before operation, to put up every intravenous infusion, and to perform other menial tasks. I remember on one occasion washing out the rectum of a baby with Hirschsprung's disease at two o'clock in the morning, and saying to myself "Have I come 3000 miles to wash out a rectum?" The answer was "yes" because by doing that procedure myself I know exactly how to tell others to do it. Consequently, this training in the immediate and direct care of the neonate is a vital part of training in paediatric surgery, and it is impossible to gain this experience if the trainee comes into paediatric surgery at a higher level.

Recently training programmes in surgery have been planned by special committees of the Royal Colleges of Surgeons, and it is relevant to review the main standards that have been laid down for training in paediatric surgery, since they include a special reference to training in neonatal surgery. Each specialty has its advisory committee and the committee for paediatric surgery includes two representatives of the Royal Colleges of Surgeons (who are in fact paediatric surgeons) and three representatives of the British Association of Paediatric Surgeons. All the specialist committees have accepted that an adequate training in surgery in general is essential. The requirement for the fellowship examination of the colleges includes general surgery, accident and emergency surgery, and at least one specialty over four years, and the completion of the requirements of the fellowship is accepted as evidence of adequate training in surgery in general. Three years must be spent in post-fellowship training, and two of these years must be spent at the level of senior registrar.

RECOGNISED HOSPITALS

These three years of post-fellowship training must be spent at a hospital recognised as giving adequate experience in accident and emergency work in children, general surgery of childhood, and neonatal surgery. It is chiefly but not exclusively in neonatal surgery that there has been most difficulty in deciding what is and what is not adequate experience. Some hospitals are so specialised that a child with appendicitis or a head injury is a rarity, and if a candidate had not already had this experience before joining he would clearly not be in a strong position to claim a certificate of completion of training without it. Similarly, there are some departments of paediatric surgery where the volume of accident and emergency work and of general surgery in childhood is considerable, but the experience that a trainee could have in neonatal surgery is so limited that one would doubt the wisdom of recognition.

Several factors affect the experience in neonatal surgery which a senior registrar would have during his tenure of office in a department of paediatric surgery. The first is the total number of neonates flowing through the department, and a second is whether the range of such cases is sufficiently wide to give the necessary experience. Several years ago many units were undertaking a large volume of surgery for spina bifida in the neonatal period, and although the total number of neonates under the care the department might have seemed adequate the distribution might have been so unbalanced in favour of spina bifida that the staff's experience of other conditions would have been minimal. In the same way in some units patients with pyloric stenosis might form a dominant element of the total numbers. For this reason the specialist advisory committee has always inquired about the number of cases of spina bifida and pyloric stenosis included in the total numbers of neonates. This is not to say that they believe that experience in the surgery of myelomeningocele or the surgery of pyloric stenosis is unimportant; rather that there must be a sufficient number of other conditions as well.

Although the specialist advisory committee has laid down no specific criteria, they have in their discussions had it in mind that if a unit receives fewer than 50 neonates a year (apart from those with pyloric stenosis and spina bifida) it is unlikely, but not impossible, that recognition would be recommended. Similarly, if a centre dealt with more than about 75 neonates a year it probably would be recognised for training.

It is easy to criticise criteria such as these, but if we think that training in neonatal surgery is an essential part of the paediatric surgeon's training we must be prepared to say what the minimum requirement should be. In a centre where fewer than 50 of these neonates are seen, the senior registrar is likely to have direct personal experience of fewer than 40 a year because he will be on holiday at some time and is likely to be off duty when some patients are admitted. This number is, of course, considerably reduced if the neonatal surgical work is undertaken by two or more surgeons working as isolated units. In circumstances like these a senior registrar may have cared for only a few infants and probably undertaken only a small amount of neonatal surgery himself. In these circumstances which of us would like to have our son or grandson operated on by a person of such limited experience?

Another factor that must influence the significance of the actual numbers admitted to the unit is the number of consultant surgeons undertaking this work, because this further dilutes the direct operative training. It is also likely to be influenced by the age of the consultants: a senior registrar working for two or three young consultants might be given less chance to develop his neonatal surgical skills than if his chiefs were considerably older. This is not necessarily the case, however, because I know several young consultants who are excellent at training junior doctors. Moreover, the old man is not necessarily the one who will allow the senior registrar a free hand. I well remember reading many years ago that Donovan had personally

undertaken more than 1000 operations for pyloric stenosis, and I cannot imagine that this was good for the training of his juniors.

A different practice existed in Boston when Dr Ladd was the chief and Robert Gross was the chief resident. Robert Gross used to perform the neonatal surgery in the middle of the night and tell Dr Ladd about the case in the morning—if he remembered. Perhaps I ought to add here, for the sake of my junior staff, that this is not a practice I recommend.

TOTAL CARE

The training of senior registrars in neonatal surgery is not limited to developing an adequate surgical technique but is largely concerned with the total care of the infant. This demands an awareness of the nutritional and environmental requirements of the newborn and especially of the small baby. Few of our trainees have had formal training in a paediatric medical unit, but this by no means implies that they cannot learn what is required about the care of healthy and, particularly, sick infants. Indeed, we expect them to learn, and they cannot continue to undertake this work unless they are prepared to learn, with the guidance of more senior people in the team.

It has sometimes been suggested that a medical registrar should be attached to the neonatal surgical unit and have responsibility for all the non-surgical management. I think this would be an abrogation of the responsibilities of the paediatric surgical team and would lead to seriously defective training of our paediatric surgeons. They would regard themselves merely as plumbers or surgical technicians, and I think the quality of care would deteriorate. This is not to say that help and advice is not sought and welcomed by us from our medical colleagues, particularly those with a special interest in and knowledge of neonatal medicine. Nevertheless, the nutritional and fluid and electrolyte problems of a baby recovering from operation are influenced by aspects that may be at once apparent to the paediatric surgeon but not to the paediatrician. Consequently, it is important that the surgeon should be responsible for looking after a patient while he is in his care, but I am very much in favour of close collaboration and consultation with our medical colleagues. Indeed, I believe that regular and frequent contact between the two sides of the hospital is important and not only between consultants, because those who are training in paediatric medicine have much to learn from observing and discussing the problems that arise specifically in these surgical patients, and vice versa.

Organisation of neonatal surgery in Britain

In 1968 the Ministry of Health published a report on surgery for the newborn, and one of the recommendations was that "neonatal surgical units should have access to at least 10 cots, since any lesser number was unlikely to justify the provision of full ancillary services of the special nature required in radiology, pathology (including biochemistry and bacteriology) and indeed in nursing. Unless there is an adequate throughput of patients (which we do not think would arise if the unit were fewer than 10 available beds) there will be insufficient operative experience for the surgeons concerned and for the training of junior staff."

The report emphasises that the number of neonatal units should be limited to give this adequate experience, pointing out that "babies travel well provided suitable arrangements for the journey can be made." The report continues: "We consider that in most areas it would be preferable to establish a large unit or units rather than a number of small units." This is an extremely important recommendation. I realise that there are many paediatricians who see and diagnose congenital abnormalities which require surgery, and they would prefer to continue the non-surgical management of these infants, calling in their surgical colleagues merely to perform the operation. I am sure that most of us have been called on to rescue this type of patient after the general surgeon has found the management of the surgical complications of operation in such infants to be beyond his capacity or skill.

The report mentions a few exceptions—for example, cases in which the work is "undertaken by fully trained general surgeons who had additionally both training and experience in this particular field and who were prepared to devote at least 4 or 5 sessions a week to paediatric surgery." Many general surgeons enjoy operating on a small baby from time to time but they would certainly not do so if they thought that the paediatrician was not prepared to accept total responsibility for his non-operative management. The burden of decision, therefore, falls on the paediatrician, and, much as I know they enjoy looking after these babies I would ask them to consider seriously in each case whether they are sure that retaining the baby within their own unit and asking the help of a general surgeon will give the quality of care that they would themselves ask for a close relative.

Ethical responsibilities of the neonatal surgeon

When a family doctor or a paediatrician telephones the hospital about the admission of a patient to the neonatal surgical unit we tell him that all that is absolutely necessary is 10 ml of the mother's blood and consent for operation. The consent form is usually signed by the mother as soon as the provisional diagnosis has been made, and the doctor obtaining the consent is often not in a position to explain fully the possible diagnosis and lines of treatment; nor indeed is the mother in a receptive state of mind so soon after the birth of the infant because of her anxieties about his health.

Now the father is often able to accompany the child and we much prefer this, because we can ourselves explain what we think is wrong and what action we recommend. It is sometimes not sufficiently appreciated that not every baby admitted to the neonatal surgical ward undergoes operation. In our series about 10-15% of babies did not have operation after admission to this ward, either because we thought the provisional diagnosis was wrong, because we thought operation should be delayed, or because we thought in all circumstances that operation was not justified.

It is this last aspect that I want to discuss in some detail. If we are to come to a reasonable judgment on these issues it is essential that we should be precise about our definitions. I will illustrate my points, firstly, in relation to congenital anomalies which are in themselves lethal and secondly, in relation to conditions that are not lethal.

INTESTINAL OBSTRUCTION

Intestinal obstruction in the newborn is a lethal condition of which there are many causes, one of which is atresia of the small bowel. In this condition undoubtedly the baby will die unless operation is undertaken; the operation has a good chance of success, and if it is successful and bowel continuity is restored there are unlikely to be any sequelae. There is no difficulty in explaining the condition and the need for operation to the parents and giving them some idea of the prognosis; consent for operation is usually given at once.

MECONIUM ILEUS

A second lethal condition is one with physical sequelae, such as meconium ileus. In many centres of neonatal surgery the standard procedure is the Bishop-Koop type of operation, which has a reasonably good chance of overcoming the obstruction, and the enterostomy is closed later. Yet, the prognosis has been extremely poor, and few of these children have reached 15 years of age, either because of nutritional difficulties during infancy or because of the intractable respiratory problems. In spite of this I did not believe that we were justified in saying to the parents, "Your child will have continuous problems of nutrition and recurrent admissions to hospital for serious respiratory complications and is very unlikely to reach the age of 15, and do you give your consent for operation?" I have always thought it correct to tell them that almost all children have other problems such as those affecting the chest.

The prognosis has altered considerably, however, partly because of the work of Helen Noblett on the gastrografin enema technique of management; but the long-term prognosis has also vastly improved in the past few years because of the tremendous efforts of parents, who are participating actively in the prevention and management of respiratory problems. So the outlook is now less gloomy than it was.

DOWN'S SYNDROME AND DUODENAL ATRESIA

A third example is of a lethal condition with mental rather than physical sequelae. A good illustration is duodenal atresia associated with Down's syndrome. Without operation the baby continues to vomit for perhaps 10 to 14 days and by that time he is likely to succumb. With operation he has a good chance of survival with no physical defect other than the facial appearance, but some mental retardation is almost certain, and is usually considerable. There are several

paediatricians and surgeons who would advise against operation, presumably on the grounds that the child will be an undue burden for the family and for the community. The final decision rests with the parents and as there is no desperate urgency for operation during the first 48 hours they must be given the chance to discuss it themselves.

A professional man gave consent for operation on his baby on the third day of life, and as he worked for a hospital authority he undoubtedly had the background knowledge on which to base his decision. His two older daughters had consoled him by saying "at any rate, Daddy, he won't have to worry about his O level examinations." (I saw his son about three years ago attending an orthopaedic clinic for talipes, and he is one of the bright ones.)

The contrary decision by parents in America at the beginning of this decade produced a furore of disapproval. In theory it would be possible in cases like this to approach the court to have the child made a ward of court and permit operation, but I have no personal knowledge of this being done.

My personal advice to the parents would be to permit operation, but if they do not give consent I would be careful to avoid any comment that would leave them with a longstanding feeling of guilt.

CRITERIA FOR OPERATING

That does not mean that I would advise operation on all babies with lethal congenital anomalies. A baby was admitted with oesophageal obstruction which would certainly result in death without operation. The child also had microcephaly, enophthalmos with probably no vision, absent right arm, imperforate anus, and probably kidney anomalies. I did not advise operation on this baby and the baby died within two or three days. In the case of a similar baby in America the parents refused consent for operation, but some doctors took the case to court and the judge ruled that surgery should be performed. Where should the balance lie in these cases where death is certain without surgery?

McCormick[1] emphasised that absolute rules about specific cases are completely impracticable, but he did suggest guidelines and I find that I agree with these, and that they form a basis on which I have formed judgments. He suggests that if a newborn baby is judged to have the potential for developing human relationships then we should offer every help we can. I believe that this was the case of the mongol baby with duodenal atresia, but I do not think this applied in the other complex case of oesophageal atresia that I have mentioned.

SPINA BIFIDA

I would now like to turn to conditions that are not in themselves lethal but lead to serious disability—for example, spina bifida. There is a widespread belief among the general public, and indeed among nurses and doctors, that if you operate on a baby with open spina bifida the baby will live but if you do not operate the baby will die. This is simply not true. At one time, 28 years ago, I was caring for babies with open spina bifida and none of them received operation in the newborn period, yet quite a number of the severely affected ones lived, being followed up each month, and at about 18 months of age had an operation on the swelling on the back.

Operation aims at preserving active movement in the lower limbs and also removing the swelling. It is by no means a life-saving operation and was never intended to be so. From a strictly medical viewpoint I place the cases into three categories.

Firstly, there are those babies likely to die within a few days, perhaps because of other anomalies such as haemorrhage into the ventricles or severe congenital heart disease. None of these babies would be offered operation, because operation would have no bearing at all on whether they lived or died.

Secondly there are babies who are unlikely to die within a few days but in whom the wound on the back is not suitable for operation; indeed, if operation were performed primary healing would be unlikely and the resulting infection would be far worse than if no operation were done at all. One example was a child with an extensive lesion. Neonatal operation was not advised so that he should die. He refused to oblige, however, and came to us with an enormous swelling on the back that had healed spontaneously, and we were able to remove the swelling. Another indication for conservative management is a severe kyphos. Operation would not be advised, but the baby would have simple dressings and the wound would be protected from pressure; many wounds heal spontaneously. One girl with such a condition is now a part-time research secretary.

Thirdly, there are those babies who are unlikely to die within a few days and in whom the wound is suitable for operation and has a good chance of primary healing. If the doctor or midwife has seen active movements of the legs after birth the baby clearly has some muscle power that might be lost if the neural plaque is left exposed, and we would advise urgent operation. On the other hand, some will be completely paralysed, and operation will have no bearing on the function of the legs. In this group the wound can be treated either by simple dressings or by a non-urgent operation to remove the swelling, but this should be done within 48 hours, otherwise there is a considerable risk of spreading infection. The intermediate group has activity in useful muscles and I believe these should be treated by urgent operation.

Whether the child has been operated on or not, further operations on the hydrocephalus or the renal tract or orthopaedic operations are offered to improve the function or prevent its deterioration. My own personal experience of the survival of these infants without neonatal operation on the spina bifida differs so greatly from that in other series (some with a mortality of 100%) that one is entitled to wonder whether all these infants are receiving the ordinary standard of baby care that one would expect in the 1970s or whether they are receiving drugs, for which there is no therapeutic indication, in order to make them sleepy so they will demand no feed. It is sometimes said that these infants should be left to die (or encouraged to die), mainly because their lives will be nothing but misery and unhappiness due to their disability. Yet extreme disability is not synonymous with unhappiness, and we are only at the beginning of finding ways of developing the capabilities of these patients to the maximum, either in work or recreation.

Some conclusions

I accept that the advice given by other doctors may well be different from that which I myself give, and, although I would strongly support their right to have a different view, they should be expected to state the fundamental principles on which their criteria are based.

I believe that our patients, no matter how young or small they are, should receive the same consideration and expert help that would be considered normal in an adult. Just because he is small and because he cannot speak for himself this is no excuse for regarding him as expendable, any more than we would do so on account of race or creed or colour or poverty. Nor do I think we ought to be swayed by an argument which says that the parents have less to lose because he is small and newborn and has not yet established a close relationship with them or indeed because the infant himself does not know what he is losing, by missing out on life.

There are some ways in which modern society cares greatly about those who are less well-off—the poor, the sick, and the handicapped—but it seems that newborn babies are often given less than justice. Our primary concern must be the wellbeing of the patient—the neonate—so far as it is in our power to achieve it. In his battle at the beginning of life it could well be that his main defence will be in the hands of paediatric and neonatal surgeons.

Reference

[1] McCormick, R A, *Journal of American Medical Association*, 1974, **229**, 172.

A patient aged 78 suffers from frequent attacks of vertigo brought on by sudden head movements on rising from his chair. He also complains of catarrh, "noises in his head," increasing deafness, and loss of weight. Are there any tests that would help exclude inner ear trouble?

Vertigo at the age of 78 and associated with head movements is more often caused by vertebrobasilar ischaemia than by disease of the inner ear. Nevertheless, in view of the patient's increasing deafness and tinnitus referral to an otologist would be advisable.