CERTAIN ASPECTS OF SURGERY OF THE NEWBORN*

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To those who interest themselves primarily in the surgical problems of infancy and childhood, there seems to be no end to new ideas which can be developed in the operative and post-operative care of children, which lead to smoother convalescence, decreased morbidity, and lower mortality rates. In the field of pediatric surgery, however, the challenge still lies in the surgical management of those congenital anomalies which are incompatible with life, but which are amenable to surgical correction.

There are four such problems which might be included in this group without question. They are omphalocele, atresia of the esophagus with or without tracheoesophageal fistula, atresia of the bowel and imperforate anus. To this group I would also add meconium ileus and diaphragmatic hernia. Meconium ileus should be added because of the distressing mortality this problem carries with it about the country, and diaphragmatic hernia because its mortality, although not one hundred per cent, is so close to it as to be included in this series.

The management of omphalocele was moderately efficient as outlined by Ladd and Gross[1] some years ago, but an even superior method is that described more recently by Gross[2], wherein the membranes of the omphalocele are not dissected free, but rather are covered by skin which can be loosened from surrounding structures and stretched over the surface of the membraneous covering of the abdominal viscera. We have made but one slight improvement on this technique. In large omphaloceles where disproportion between the protruding viscera and available skin is great, it is possible to compress the abdominal viscera by rolling the membraneous covering in much the same way that one would roll down the top of a paper bag after bringing the two sides together, and then to approximate the skin edges while holding the viscera, thus tightly compressed. Omphaloceles extending from the xiphoid to the pubis, which otherwise might not be correctible by surgical means, can be closed in this fashion.

In reference to problems of atresia of the bowel, recovery still seems to be proportional to the age of the patient, the surgical care exercised at the time of operation, and the excellency of post-operative care.

Meconium ileus, diagnosed early by the signs of vomiting, distention, viscid secretion, and shadows resembling feces on x-ray examination of the abdomen is being successfully treated insofar as the obstructive problem is concerned by a variety of surgical approaches with a decreasing mortality. Whether one performs a temporary ileostomy or resects the affected portion of the bowel, the use of pancreatic enzymes and preserved duodenal juice are of great help in establishing the passage of stools.

In the treatment of diaphragmatic hernias, we have abandoned the abdominal approach and routinely operate transthoracically.[3] In the thoracic approach it is possible to open the chest of a distressed infant in a matter of a minute or two, and to eviscerate the abdominal organs from the thoracic cavity, at which moment the baby becomes a satisfactory patient from the point of view of cardiac and respiratory reserve. The collapsed lung can expand, the heart is no longer compressed, and the mediastinum may shift back to its normal position. The surgeon need then be in no hurry, but can at his leisure replace the abdominal viscera into the peritoneal cavity through the diaphragmatic defect; the chest is then closed in the usual fashion after suturing the diaphragm, and the infant returned to his crib with a chest wound which he seems much better able to handle than a large abdominal wound behind which are more abdominal contents than the peritoneal cavity can conveniently accommodate. We have done fourteen diaphragmatic repairs by this technique with one death, and that in a child with premature ossification of the skull and subdural and epidural hematomas.

Having thus disposed of four problems with little more than a word, I would like to turn our attention to the two remaining problems: atresia of the esophagus, and imperforate anus, and outline a method of management for each which we have found satisfactory and which in each instance seems to be some-

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what at variance with the usual techniques employed.

In the management of atresia of the esophagus our earlier method of management was that used by most, a retro-pleural approach through the posterior mediastinum, at which time the tracheoesophageal fistula was ligated and an end-to-end anastomosis carried out between the blind pouch above and the open esophagus below. On the day after this procedure a gastrostomy was done, feedings were delayed for a period of five to ten days, and frequently post-operative dilatations of the esophageal anastomosis were necessary in order to permit the passage of food through the sutured esophagus. This method of management had many faults. The operative procedure was long, it was difficult to stay out of the pleural cavity, the hospitalization was prolonged, and economic loss to the family was great. There was always the risk of regurgitated gastrostomy feedings, the need of two operations, and the delayed nutrition of the patient. Finally, the problem of esophageal dilatations and the occasional necessity for surgical closure of the gastrostomy was time-consuming. In addition, the patients frequently developed edema post-operatively, which in those children who died, at times approached a generalized anasarca. Under this technique we felt that we had done all that we could to improve our management, and the mortality was over fifty per cent.

At the present time, we have altered our method of caring for these children in this manner: instead of using a retro-pleural approach, we operate transpleurally and reduce the operative time from a period of two to five hours, to an average operating time of an hour and fifteen minutes. No gastrostomy is carried out following operation if we have reasonable assurance that the suture line is tight. On the morning of the second post-operative day the patient is fed glucose water and his formula is increased rapidly to something similar to that given to most newborn infants. By this method, not only is anesthesia and operating time decreased, but only one operation is necessary, hospitalization is shorter, the economic loss to the family is less, nutrition is maintained, and surprisingly enough, esophageal dilatations do not appear to be necessary as frequently as heretofore. Edema is now seldom seen because we maintain these children on no salt (except that contained in blood transfusions) for the first three post-operative days, and then limit fluids to approximately 60 cc./lb./day.

If one excludes patients with a second anomaly incompatible with life and patients with multiple congenital defects, which in themselves carry a high mortality, the mortality is surprisingly low. Out of 20 such patients we have had 15 survivals. Four gastrostomies were done in this group and two patients needed dilatations of the esophagus. This method seems to us to be a rational approach to the problem of atresia of the esophagus, not only in the hands of the pediatric surgeon, but also in the hands of the thoracic surgeon who only occasionally deals with such problems. The risks are less, the procedure easier, and the results better.

The problems resulting from the improper management of imperforate anus have long been a burden to us. Because this is the most common of the congenital anomalies incompatible with life, a large number of surgeons encounter the lesion and operation is carried out by many unfamiliar with the end results of this variety of surgery. Most patients with imperforate anus are divided into two types: Those in whom the blind rectal pouch can be reached from below, and those in whom the distance between the anus and the colon is too great to be bridged by a perineal operation, in whom a colostomy seems the procedure of choice. This is a satisfactory classification of patients, but the selection of operative procedures for each is frequently unwise.

First, and most dangerous, is the common attempt to bridge too wide a gap between anus and colon by the perineal approach. When such is done it is possible to bring colon mucosa to perineal skin for a suture line, but this is done at the expense of nerve and blood supply to adjacent areas. Such suture lines, under great tension, do not hold, and there develops in a matter of days after operation a rectal canal surrounded by fat and muscle and lined with granulation tissue. This in turn becomes a tight, relatively long stricture which can make the patient a rectal cripple for the rest of his days. Not only are these strictures very difficult to correct but

frequently their correction leads to incontinence. If they are not corrected, obstructive megacolon may ensue.

The second variety of mistake is made in those patients in whom a colostomy seems necessary. The colostomy is carried out in the sigmoid colon, thereby utilizing the redundant loop of colon which should be left free to provide bowel to construct pelvic colon, rectum, and anal canal at the time of definitive operation. These two errors can be eliminated by never attempting to bridge a gap between colon and anus which is greater than 1.5 cm., and when a colostomy seems indicated, by placing it in the right side of the transverse colon in order to leave as much distal colon as possible for use at the time of definitive operation.

We attempt to divide all of our imperforate anus cases into three groups as to operative procedure. First, patients with a blind gap of 1.5 cm. or less are approached through the perineum, and an anus constructed which usually has some sphincter. Secondly, patients who weigh less than four and a half pounds, or who present some other medical problem which contraindicates major surgery, have a colostomy performed in the right transverse colon. These two methods could be carried out satisfactorily in almost any community where surgery is practiced.

At the Children's Hospital of Philadelphia, we have added a third category of operation,[4] believing that we have sufficiently good anesthesia, nursing, and house officer care to warrant such type of work. Those with a gap between anus and colon of more than 1.5 cm. have a definitive operation carried out at the time of admission to the hospital. A combined abdomino-perineal type of approach is carried out with the abdomen being opened first and the blind end of colon secured and exteriorized. The patient is draped in such a way that one leg is outside the drapes and in the operative field. A small section of skin and skin only is excised from the region of the anus, the external sphincter cleanly divided, and a small hemostat is inserted into the perineal body. This aperture is gradually enlarged until it is possible to reach up into the true pelvis, and bring down through the perineal canal thus made the blind loop of colon and exteriorize it through the newly formed anus. These children are taken care of once and for all, and the only thing that remains to be done to them is to have the excess colon trimmed off by a very minor procedure just before discharge from the hospital.[5]

Patients of three days of age or less tolerate this extensive surgery without difficulty. It is of interest to note, however, that if such an operation is not carried out in this very early neonatal period, it becomes one of the most shocking procedures one can undertake in pediatric surgery, and therefore, by experience we have learned that if this cannot be accomplished early, one should do a colostomy and then at a later date, after the age of three or four months, perform the definitive operation by the combined abdomino-perineal approach just described. When patients are cared for by the three techniques outlined there should be no rectal strictures. Tight anuses can be dilated in infancy, resulting in a cosmetically acceptable anus, and a well-functioning lower bowel. Such patients take longer to train for stool habit than normal babies, but they usually can be made into satisfactory citizens from the point of view of bowel function.

I will not go into the many problems of fistulae between the colon and the urinary tract, which so frequently complicate this congenital defect. They can be managed satisfactorily during the procedures outlined. We have operated on almost forty of these youngsters in the last four years with one death and one failure. Several premature babies have died from other congenital anomalies before surgery was undertaken. The smallest baby we successfuly treated weighed two pounds, twelve ounces. None are now rectal cripples nor need look forward to that existence in the future. In the same period of time we have treated a large number of patients secondarily who had previous surgery at the time of birth, surgery which was not carried out according to the principles here stated. We think that the proper management of such patients could eliminate the very serious problems we see of fecal incontinence, megacolon and rectal stricture following surgery of imperforate anus.

We believe that much can yet be done to improve the technique of operative proced-

ure and post-operative management of patients with atresia of the esophagus and imperforate anus. We realize that a low mortality rate in a small series of patients may be misleading and that we have had a particularly good succession of patients in both categories. However, we do believe also that some of the improved mortality is due to careful attention to detail based upon correctible errors of the past, and suggest that the method of management outlined for each of these conditions warrants trial in other pediatric installations.

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