Introduction to Neonatal Surgery

1

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In 1989, the British National Confidential Enquiry into Perioperative Deaths (NCEPOD) ruled "that pediatricians and general surgeons must recognize that small babies differ from other patients not only in size and stated that they pose quite separate problems of pathology and management" [1].

As pediatric surgeons, we are convinced that children are not just small adults. This is all the more true for neonates. Neonates have some unique problems that require very special knowledge, special surgical managements, and facilities specifically designed for them. Pediatric surgeons must understand their special needs and that of their relatives. They must learn team working with other specialists. They have to create the conditions to follow their patients from birth into adulthood as the treatments do not end with the healing of the problem but once the child has become an adult.

With the rapid advances in fetal diagnosis, babies are no longer referred at the time of birth, but when prenatal diagnosis is made even if termination of pregnancy is planned because of an expected poor prognosis. Direct contacts between the prenatal team, the neonatologists, and the pediatric surgeons are also highly recommended to ensure continuity in the messages delivered to the parents.

We live now in the era of evidence-based medicine (EBM), and best evidences are generated from prospective trials. Unfortunately, when compared with adult general surgeons who may operate hundreds of similar cases, pediatric surgeons perform a great variety of different procedures but few of each. Consequently, the indications for surgery and the type of procedure performed in neonates are rarely supported by randomized controlled trials, the majority being supported by retrospective studies and surgeon's preferences. Hall and Pierro have tried to summarize what was the EBM randomized controlled trial (RCT) (level I evidence) of some of the most common neonatal procedures (esophageal atresia, congenital diaphragmatic hernia (CDH), bowel atresia, anorectal malformations, anterior abdominal wall defects, congenital lung lesions, Hirschsprung's disease, inguinal hernia, necrotizing enterocolitis, pyloric stenosis). Their review highlights the fact that a quality evidence base supporting many of these interventions is lacking. Only a few randomized controlled trials have been done in neonatal diseases such as congenital diaphragmatic hernia, necrotizing enterocolitis, pyloric stenosis, and inguinal hernia. All of these trials have been based on collaboration between pediatric surgical units convinced by the importance of networks to promote multicenter prospective studies [2].

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In 1999, Hardin and Stylianos undertake to study the current state of the pediatric surgery literature and its value in determining best clinical practice. As of March 1, 1998, they found 9373 references provided through Medline. After review, only 34 studies (0.3%) were classified as prospective, randomized, controlled studies [3]. Twelve years later, Ostlie and St Peter have done a similar study in 2010, collecting all randomized controlled trials from January 1999 through December 2009 published in the English literature excluding transplant, oncology, and the other non-general subspecialties, to conclude that randomized controlled trials represent less than 0.05% of all publications involving pediatric surgery in the 26 journals with at least one trial (<1 trial for every 200 articles) [4]. It is concerning that they document a similar lack in the twenty-first century, despite the increased educational and public expectations placed on EBS.

In a recent lecture, Juan Tovar advocated to which extent pediatric surgery needs to base its therapeutic attitudes and operations on a solid research background [5]. This is particularly difficult on the field of clinical research because of the low prevalence of many of the conditions involved and also because of the fact that patients are minors that are not entitled to give informed consent by themselves for randomized studies. As regards laboratory research, this specialty is scarcely interesting for basic scientists. This situation can only be improved by prospective randomized studies performed in network collaboration with other hospitals/countries and by basic research conducted by pediatric surgeons and/or in association with other scientists [5].

Among the three particularly relevant recommendations that NCEPOD made in the report on perioperative pediatric deaths [1], the first one was: "surgeons and anesthetists should not undertake occasional pediatric practice". This was also a statement of the European Union of Medical Specialists (EUMS) in 1995: "Surgeons taking care of children should have adequate training in a pediatric surgical unit. They should also continue to have regular exposure to this type of patients." Neonatal surgery should only be carried out by surgeons and anesthetists whose pediatric workload is of adequate volume to maintain a high level of surgical competence and to allow the training of the residents. Congenital birth defects complicate 3–6% of pregnancies leading to live birth. As for example of the structural birth defects associated with significant mortality/morbidity, CDH is among one of the most common anomalies, occurring in about one per 2000–3000 live births. Consequently, the opportunity of training—and to keep his expertise—on a CDH is low. Added to these facts, the combination of a shortened training period and the "new deal" on junior doctors about the number of hours has serious implications for training.

This means that neonatal malformations need to be concentrated in some centers to allow sufficient case load. There are arguments for and against such large regional specialist pediatric centers. The benefits of centralization include concentration of expertise, more appropriate consultants on call, development of support services, and training. The disadvantages include children and their families far from their homes and the loss of expertise at a local level. The benefits of centralization far outweigh the adverse effects of having to take children to a regional pediatric intensive care center [6]. Unfortunately, in many places, politicians favor the multiplication of small regional centers to satisfy their voters who are poorly informed of the cold hard facts.

Nowadays, it is unacceptable to train on real patients. The new technologies, namely, minimal invasive surgery and simulators, have been of great help using simulation technology to reduce risks to both students and patients by allowing training, practice, and testing in a safe environment prior to real-world exposure. This is supported by interest in quality of care, restrictions on the use of animal models, limited number of cases, medicolegal pressures, and cost-effective performance. Many models are available. The usefulness of mechanical simulators with faithful models have been proven efficient: hypertrophic pyloric stenosis (Plymale, 2010), closure of patent peritoneo-vaginal tract (Breaud, 2014), pyeloplasty (Breaud, 2014), esophageal atresia (Maricic and Bailez, 2012; Barsness, 2014), and

CDH (Barsness, 2013). They have shift to realistic interactive models. Computerized modern technology with electronically assisted devices and virtual reality environment has provided new tools to the mechanical simulators.

We have now the tools to evaluate cognitive/clinical skills, technical skills, and social/interactive skills as we have seen how important this could be in neonatal surgery. Surgical simulators (mechanical, computerized, virtual) and models (animals and interactive) are the appropriate tools to learn, to train, to assess surgical skills, and to keep his expertise, in spite of the small number of cases.

Becoming a pediatric surgeon requires completion of one of the longest training programs among the medical systems and probably the widest as they have to learn a great variety of procedures but few of each. While specialization among adult surgeons usually focuses on a particular organ or region of the body, pediatric surgery deals with a defined age group. Pediatric surgeons are trained to operate anywhere on the body, and thus they appear to be probably the last general surgeons. They must ask their authorities to provide them modern tools to avoid training on real babies. Undoubtedly, this is expensive, but as said by Bok Derek at Harvard Law School, "If you think education is expensive, try ignorance!" They have to learn teamwork and multicenter collaboration. This will be the challenge of the new generation of pediatric surgeons to promote collaboration between pediatric surgical units and to create networks as to publish multicenter prospective studies with adequate sample sizes.

In spite of these daunting challenges, they remain some courageous volunteers as you probably are, you reader of this book. We need neonatal surgeons, motivated, well trained, wishing to transmit their skills and their knowledge to the future one.

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