although further research is needed. However, strong resistance to the joining of vitamin A supplementation to EPI vaccinations has also been registered, mainly because there is some evidence of toxicity. In Bangladeshi children, 15 mg (50 000 IU) retinol given with diphtheria, pertussis, and tetanus vaccines resulted in an 11% excess incidence of bulging fontanelle in the subsequent two days.[18] The medical significance of bulging fontanelle is disputed but, even if it is harmless, parental concern about the symptom could jeopardise both the supplementation and the vaccination programmes. Thus caution is required before implementing this approach widely.

There are additional reasons for caution about including vitamin A capsules with EPI vaccines. Vaccines are given at about 6, 10 and 14 weeks for diphtheria, pertussis, and tetanus and 9 months for measles. However, as breast feeding is extremely effective at preventing vitamin A deficiency,[19 20] infants at these ages are not the most at risk population for vitamin A deficiency. Furthermore, in young breast fed infants, respiratory diseases are a far more important cause of morbidity and mortality than gastrointestinal diseases whereas vitamin A supplements appear to protect primarily against gastrointestinal illness. Therefore, there is still debate whether young infants need or should be given large doses of vitamin A, whether with or without vaccination.

Promotion of breast feeding is an important component of any programme to improve vitamin A status. The quantity of the vitamin delivered to the infant through breast milk can be increased by giving high dose capsules to mothers within four weeks of giving birth when there is no danger of their being pregnant and thus no danger of the teratogenic effects of vitamin A. A single postpartum supplement to the mother can increase her milk retinol concentration for at least eight months and infant vitamin A stores at 6 months.[20] Breast feeding and postpartum supplementation should be advocated strongly since they are safe, cheap, and an effective means of improving vitamin A status.

Vitamin A status may also be improved by decreasing the prevalence of infection. Prolonged or severe diarrhoea may impair absorption of the vitamin and certain infections, particularly those which damage epithelia, may result in depletion of retinol stores.[21 22] Thus, successful immunisation against measles has a high priority and it would also be interesting to determine the effects on vitamin A status of deworming or of impregnated bed nets for prevention of malaria.

Conclusions

That adequate vitamin A status is an important component of protection against childhood infectious disease mortality in many developing countries is now well established. There remains considerable scope for improving practical approaches by which to promote vitamin A consumption. Cooperation between basic scientists, medical workers, public health administrators, and educators could have a major impact on child health.

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Minimal access surgery in paediatrics

Wickham noted that three seminal events have indelibly altered surgery: the introduction of anaesthesia, the development of antiseptics, and endoscopy.[1]

Minimal access surgery (MAS) or 'endoscopic surgery' is the execution of established surgical procedures in a way that leads to a reduction of the trauma of access. Surgical procedures are conducted by remote manipulation within the close confines of body cavities or lumen of hollow organs under visual control via telescopes and television screens. Endoluminal surgery (bronchoscopy, gastrointestinal endoscopy, endourology, and lithotripsy), an important part of MAS, is already well established and is not discussed further.

History

The idea of MAS is not new; the use of tubes in medicine dates from the earliest days of civilisation in Mesopotamia and ancient Greece. Modern endoscopy started in 1805 when Bozzini, an obstetrician from Frankfurt, using

candlelight through a tube, attempted to examine the urethra of a patient.[2] Almost a century later in 1897, Nitze, a urologist from Berlin, produced the first usable cystoscope with lenses and platinum wire for illumination.[3] In 1901, von Ott from St Petersbourg reported the first abdominal cavity inspection, by focusing a head mirror into a speculum.[4] A year later Kelling, using a cystoscope after insufflation with filtered air, reported laparoscopy in a living dog to a meeting in Hamburg.[5] In 1910, Jacobaeus, a surgeon from Stockholm, performed the first laparoscopy and thoracoscopy in a human using a cystoscope.[6] Throughout the 1930s Kalk from Germany popularised diagnostic laparoscopy and opened the way for the development of operative laparoscopy[7] and, by the 1940s, laparoscopy was developed for gynaecological practice by Palmer in France.[8]

The introduction of fibro-optic light and advanced rod lens system by the British physicist, Hopkins, in 1952 led to a dramatic worldwide increase in the use of laparoscopy and endoscopy in general.[9] There is no doubt, however, that the current explosion of MAS would not have happened without the initial breakthrough of laparoscopic cholecystectomy by Moruet in Lyon, France in 1987.[10]

The application of laparoscopy in children was virtually unknown until 1971, when Gans and Berci investigated and reported the procedure as a safe, diagnostic measure.[11 12] Since then, the laparoscope has been used by a few paediatric surgeons to aid in the diagnosis of impalpable testes, abdominal pain, hepatobiliary disease, and intersex anomalies. The first specific reference to thoracoscopy in paediatrics was by Rodgers and Talbert in 1976, describing the use of this method in the diagnosis of pleural and pulmonary lesions in several patients.[13] From 1991, however, there has been increasing interest in performing operative procedures in infants and children by laparoscopic and thoracoscopic methods.

Procedure

The procedure is performed under general anaesthesia with controlled respiration. In thoracoscopy, one lung ventilation is often required. Laparoscopy and thoracoscopy entail the creation of carbon dioxide pneumoperitoneum and pneumothorax respectively. The relative lack of complications from combustion and gas embolus are the main advantages of carbon dioxide compared with air and other gases. In thoracoscopy, the pleural space is initially entered via a small stab incision and a pneumothorax is induced. In laparoscopy, however, most surgeons use an insufflation needle inserted through the skin and into the peritoneal cavity (closed method laparoscopy). This technique bears the risk, albeit small, of injuring the abdominal viscera. I, therefore, prefer an open cut down technique to insert a primary cannula, through which a pneumoperitoneum is created (open method laparoscopy).[14] This is particularly important in infants as the abdominal cavity is very small, the liver margin is well below the rib cage, and the bladder is an intra-abdominal organ. The laparoscope is then inserted through the primary port and, after exploration of the cavity, the size and position of the secondary 'working' cannulas are selected based on the size of the patient and the type of procedure.

Indications

DIAGNOSTIC LAPAROSCOPY

Laparoscopy is an ideal method for the evaluation of impalpable testes and intersex anomalies. In the differential diagnosis of biliary atresia and hepatitis, laparoscopy allows visualisation of anatomy, cholangiography, and a safer biopsy of the liver.[12] It is reliable in the diagnosis of suspected appendicitis and tubo-ovarian conditions. In the assessment of recurrent abdominal pain, recurrent gastrointestinal bleeding, abdominal trauma, ascites, portal hypertension, and abdominal tumours, laparoscopy provides valuable information and a means for biopsy and angiography.

THERAPEUTIC LAPAROSCOPY

Laparoscopic appendicectomy offers a number of real advantages when compared with classic appendicectomy.[15] With intra-abdominal testes one or two staged mobilisation of testes or orchidectomy is easily performed via a laparoscope. We have modified the conventional Ramstedt pyloromyotomy for the laparoscope[16]; laparoscopic high ligation of varicocele is effective.[17] Cholelithiasis is not a common condition in childhood, however, laparoscopic cholecystectomy is a straight forward procedure in children. Laparoscopic adhesiolysis for localised acute and chronic adhesions is not difficult. Meckel's diverticulectomy, ovarian cystectomy, and lymph node resection are all being performed laparoscopically. We have performed laparoscopic Nissen fundoplication for gastric reflux, insertion of gastrostomy tube, and nephrectomy in children as small as 8 kg in weight. The feasibility and efficacy of laparoscopic splenectomy, partial nephrectomy, and intestinal resection are being evaluated. Fetoscopic surgery in the management of prenatal anomalies in both experimental animals[18] and humans[19] are under investigation.

THORACOSCOPY

The application of thoracoscopy in paediatric surgery is still very limited. However, the benefits accruing from the avoidance of a thoracotomy by the established thoracoscopic procedures are even greater than those given by laparoscopic surgery. The various therapeutic procedures that are currently performed are: diagnostic thoracoscopy for chest trauma and tissue biopsy, sympathectomy for hyperhidrosis, treatment of pneumothorax and pleural effusion, and excision of bronchogenic cyst.[20]

Advantages

In addition to avoiding large, painful access wounds of conventional surgery, MAS allows the operation to be carried out with minimal trauma inside the body cavity with the avoidance of exposure, cooling, desiccation, handling, and forced retraction of viscera. Therefore, the overall traumatic assault on the patient is reduced drastically and, as a result of this, postoperative pain, ileus and wound complications, such as infection and dehiscence, are reduced and recovery is accelerated. Furthermore, the endoscopic approach allows visual enhancement by the magnifying effect of the telescope and improves exposure in places such as the pelvis, subphrenic spaces, and upper chest.

Another important advantage is the greatly reduced contact with the patient's blood and body fluid. This has important implications in relation to transmission of viral disease. Experience has shown that abdominal adhesion formation, which may become the source of recurrent pain, intestinal obstruction, and female infertility, is drastically reduced after laparoscopy. Other advantages include improved cosmetic appearances and possibly reduced immunosuppression and postoperative respiratory complications.

Some paediatric surgeons argue with the need to adopt the technique of MAS because infants and children recover from operations quickly. This is not a valid argument in my view simply because children do suffer the consequences of the trauma of open surgery as do adult patients. The benefits of diminished pain, shorter hospital stays, and the lower incidence of adhesions and scarring should be considered as important for children, if not more important, as they are for adults.

Disadvantages

There is a need to purchase and maintain high technology equipment, and the procedure takes longer in time, at least initially, than an open approach. The extra cost, however, and reduced efficiency may be offset by early postoperative recovery and reduction in postoperative complications.

Some of the basic difficulties of MAS emanate from the remote nature of the surgical manipulation, the lack of tactile feedback, and the two dimensional vision of the current camera systems. Appropriate training, however, and the development of three dimension videoendoscopy and exploratory ultrasound probe should redress some of these problems.

Injury to the major vessels and viscera may occur as the result of a blind cannula – needle insertion (closed method laparoscopy), diathermy burn, and inappropriate instrumentation. In a series of 77 604 laparoscopic cholecystectomies by general surgeons throughout the USA, the incidence of major vessel injury and hollow viscous perforation was 0·05 and 0·14% respectively.[21] However, the gynaecologists reported no vascular injuries in 11 000 operations.[22] Gas embolus, which is exceedingly rare, is usually due to accidental intravascular injection of carbon dioxide during insufflation through a misplaced insufflation needle.[23] These complications may be eliminated by routine use of open method laparoscopy, appropriate instrumentation, and understanding safe electrocoagulation in laparoscopy.

Cardiovascular collapse as the result of vagal response to rapid peritoneal distention[24] and tension pneumothorax, due to an unrecognised congenital defect of the diaphragm, have been reported only very rarely. During prolonged procedures, significant hypercarbia may be measured.[25] These problems may be minimised by a reduced flow rate of carbon dioxide insufflation and careful monitoring of ventilation and carbon dioxide tension.

Conclusion

The rapid expansion of MAS has had an impact on children as well as adults. Early experience is suggesting that laparoscopic and thoracoscopic surgery in infants and children is feasible, safe, and advantageous in many circumstances. Based largely on adult experience, the perceived benefits include less pain and distress, reduced hospital stay, fewer complications, and improved cosmetic appearances. With the correct conditions and guidelines for safe MAS, patient morbidity can be well contained. However, before MAS becomes widely adopted in paediatric surgery, careful attention will have to be paid to the appropriate training of surgeons. The absolute need for audit and quality assurance cannot be over emphasised.

The advent of MAS has introduced a new era of surgical management and carries significant implications for our health service. There will be cost implications, changes in consultants' practice, bed requirements, and a fresh approach to treatment and training. There can be little doubt that many aspects of the current technology and instrumentation can and will be improved in the near future, thereby increasing the ease of performance and scope of MAS.

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