

Neonatal Anaesthesia in Malta

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Introduction

This is a four year study about the anaesthesia administered in Malta for this very demanding branch of surgery neonatal, rather than paediatric. This type of surgery is meant for the relief of life threatening conditions associated with congenital defects and is often done as an emergency procedure hours after birth.

The Field of Study

The Maltese archipelago is a group of islands in the middle of the Mediterranean sea covering an area of 198 square miles and with a population of 300,000 people. During the period of study, 1st January, 1980 to 31st December, 1983, there were a total of 21,090 live births. Out of this number, 31 needed emergency surgery hours after birth to correct a life threatening congenital abnormality.

Congenital Defect	Number
Meningocele	16
Meningomyelocele	4
Imperforate Anus	3
Oesophageal Atresia	3
Omphalocele (exomphalos)	1
Diaphragmatic Hernia	1
Meconium Ileus	1
Duplication of small intestine	1
Renal Tumour	1
Lung Cyst	1

Fig. 1. Table of congenital defects needing emergency surgery.

The Hospital, where these cases were studied, is the Karen Grech Hospital, a mother and child complex comprising prenatal, labour and post-natal wards with a single operating theatre. It has also paediatric wards, a special care baby unit and a paediatric operating theatre. There are also Ophthalmological and Ear, Nose and Throat Wards with separate operating theatres. This proximity of wards to theatre helped immensely in reducing the time between the birth of the child and the preparation for the theatre. Most of the cases about to be described were on the operating table within five hours after birth.

Multiple Defects

Three cases of the thirty-one described had other birth defects. One case of oesophageal atresia also had a ventricular septal defect and needed further surgery in the U.K. Two cases of imperforate anus had other defects too, as one was a mongol and another was suffering from agenesis of the left kidney, gothic palate, low set ears and six hemi-vertebrae in the lower thoracic and upper lumbar region.

Maternal Age and Delivery

Contrary to popular belief, the age of the mother in this series of 31 cases of congenital abnormality described was quite young. In two cases only was the maternal age above 30 years. The medications given to the mother in all cases studied was Iron supplements in the last five months of pregnancy.

The delivery was normal in all except two who were delivered by lower segment Caesarian section; one case had oesophageal atresia and the labour was prolonged and foetal distress developed while the other case was diagnosed before birth by the use of ultrasound as having a large intra-abdominal tumour and an elective section was planned at the 38th week.

The Anaesthesia

The preoperative examination was carried out by the anaesthetist on call as soon as the case was diagnosed and surgery planned. An assessment of how far the birth defect interfered with vital functions was established and when necessary monitoring was ordered even before surgery. A good intravenous drip was set up utilising the umbilical vein and blood prepared for eventual transfusion. A special effort to procure fresh blood was made in most cases. Vit K 1mg stat was given immediately before surgery.

In the operating theatre, cardiac and body temperature monitoring was set up, a small disc stethoscope attached to the chest wall and a heated water bed prepared. An item of interest that has to

be underlined in the treatment of these cases was the ease with which hypothermia developed. Despite air conditioned theatres, a temperature of 28°C and a humidity of 55%, the temperature can drop to 35°C as measured by oesophageal and rectal probes. In the four cases where the thorax was opened, a drop to 32°C was noted in both leads. Hypothermia interferes with heart rate and action, makes the calculated doses of drugs inappropriately high and renders reversal difficult. One must also remember that the total blood volume of a neonate is under 300 mls (85 ml per 1 kg) and so blood loss has to be carefully calculated by weighing all swabs and blood lost replaced.

Induction of anaesthesia was given intravenously starting with:

Atropine 0.01 mg per kg body weight;
Thiopentone 5 mg per kg body weight;
Scoline 1 mg per kg body weight;

and intubation using the excellent Portex tubes. I would like to stress the use of these tubes which are kink resistant and which, though bent, will maintain their patency. By auscultation, the tip of the endotracheal tube is secured above the carina and manual ventilation started using 2 litres each of N₂O and O₂. Ayre's T piece system with a half litre holed rubber bag was used in all cases.

In this study, neuroleptic anaesthesia was carried out using:

Pancuronium 0.1 mg per kg;
Fentanyl 1 µg per kg dose.

These cases were all managed with manual ventilation and I am of the opinion that in this type of anaesthesia, the anaesthetist should remain all the time in contact with his young patient as no instrument can replace the feeling of the experienced consultant's hand as regards the degree of relaxation, the feel of the patient's lungs, the response to inflation, the depth of anaesthesia and the overall state of the patient's condition. This is what Jackson Rees of Liverpool teaches and I appreciate his sagacity and apparently easy way of managing these serious cases when the safety factor is very limited.

The position of the little patient on the table was left entirely to the surgeon to decide and full cooperation ensured a calm atmosphere during the procedure.

Anaesthesia for this serious of cases was uneventful though during reversal problems were encountered in three cases.

The reversal procedure started with closure of the skin. In one syringe:

Atropine 0.01 mg per 1 kg;
Prostigmine 0.05 mg per 1 kg.

were mixed and diluted with water to 5 cc. One cc at a time was given IV at intervals of 3 minutes until full muscle power returned. In three cases full muscle power failed to return despite giving the full dose, but there was also hypothermia of 35°C. Without giving additional doses but only rewarming the patient, full muscle power returned. It is documented that hypothermia interferes with the hepatic action of detoxifying drugs, with the kidney function of excreting drugs and their by products and with enzyme activity so that the correction of this physical state produces results without use of repeated doses of reversal drugs.

Mortality

Out of these 31 cases of life saving surgery described, 6 died after operation. There were 4 deaths due to bronchopneumonia, 1 case of insufficiency of lung tissue, 1 failure of the lung to inflate and 1 case of anasarca.

No. Congenital Defect	Cause of Death	No.
3 Oesophageal Atresia	Bronchopneumonia	2
3 Omphalocele	Bronchopneumonia	1
1 Meconium Ileus	Bronchopneumonia	1
1 Diaphragmatic Hernia	Insufficient Lung Tissue	1
4 Imperforate Anus	Anasarca	1

Fig. 2. Table of congenital defects and cause of death.

Discussion

This study is not a review of birth defects in Maltese archipelago, but only of those congenital defects that threaten life and that call for emergency surgery soon after birth. Cardiac defects are excluded from this study as they are not operated on in Malta. Birth defects that are incompatible with life are left well alone until they expire. There were three cases of anencephaly during this four year study.

The commonest system presenting with quite a number of defects in the Neurological one. In fact, there were 16 cases of meningocele or meningo-myelocele that came to surgery and all did well and at present are undergoing drainage procedures to try and prevent hydrocephalus formation or further development of same.

The Gastro Intestinal system presented quite a number of birth defects. There was one case every year of imperforate anus and the findings range from a simple anal diaphragm needing only ampullectomy to an extensive two stage procedure. There was only one death in this series but this case had many concomitant birth defects, that is one kidney only, hemi-vertebrae of lower thoracic and upper lumbar region, low set ears and a gothic palate. After the operation, anasarca developed and within 72 hours, the neonate expired.

Oesophageal atresia is encountered once a year and the outcome of the operation depends on how early the neonate is brought to the attention of the surgeon or the alertness of the post-natal ward staff to the condition. Of the three cases described, two died. One case was born in a home in Gozo and was fed glucose water a number of times despite his spluttering protests. Full fifty hours elapsed before he was brought to Malta and he was in a really bad general condition. Resuscitation was set up and when he improved somewhat and the X-ray of the lung showed some areas of aeration a simple gastrostomy was performed. Even so, he succumbed to bronchopneumonia in 48 hours. The other case was operated in 6 hours after birth and survived for one week but then presented with bronchopneumonia and fluid in the thorax probably from a leak in the anastomosis, and succumbed despite drainage and IPPR. The other case is surviving still but unfortunately had to be operated on in the United Kingdom because of a heart defect – ventricular septal defect – and is now doing well. One must remember that in the U.K. there is described an 80% mortality of this condition. (I)

A pancreatic enzyme deficiency that can be fatal unless diagnosed early presented in this series with meconium ileus. The neonate was operated on and an ileostomy performed with exteriorisation of the distal loop to allow irrigation of the colon. The lack of trypsin affects not only the gastrointestinal tract rendering meconium hard and inspissated but also the respiratory system due to lack of secretion of the goblet cells and consequently, bronchopneumonia develops. This is the commonest cause of death as reported from Great Ormond Street Hospital for Sick Children were out of a series of 109 cases, 59 died. The case described did well and left hospital on pancreatin enzyme powder treatment. At home he developed bronchopneumonia and died within a month after birth.

Diaphragmatic hernia through the foramen of Bochdalek is a potentially fatal condition. The outcome of surgery depends on the ability of the compressed lung to reinflate. During foetal life the

presence of abdominal contents in the thoracic cavity compressing the developing lung tissue leads to lack of development of the bronchioles and lack of alveolar patency. (II) This fact can only be ascertained after the operation and instituting IPPV. The one case described died in the post-operative period as one lung would not inflate at all while the other failed to take up the function of the respiration. The Los Angeles Children Hospital records a death rate of 17 out of 30 cases and the records for Liverpool region shows that 20 out of 50 cases described died. (III)

Defects of the abdominal wall are divided into Major and Minor examples by Johnstone and Rickham of Liverpool Hospital. The mortality differs depending on the type of case. Out of three cases that occurred during this four year period one died because the surgeon could not close the abdominal cavity and had to close the skin over the defect only intending to do proper surgery later on.

Unfortunately the baby died in the special care baby unit and at postmortem a bronchopneumonia was diagnosed. The Liverpool doctors report a fatality rate of 16 out of 31 cases and the argument is still going on about the technique of leaving these cases well alone to resolve gently without any surgery but only allowing the abdominal skin to grow over the defect.

A case of renal tumour diagnosed before delivery by use of ultrasound and operated soon after birth by a simple nephrectomy did very well and still survives on one kidney. Also a case of duplication of the small intestine was successfully operated on and is going well.

The Respiratory System rarely presented any congenital with defects. The only case of congenital lung cyst that was operated on did well after a simple lobectomy.

Conclusion

Neonatal anaesthesia is a very demanding branch of anaesthesia and can serve as a measure of the efficiency of the health care of a country. It is my opinion that the cases studied provide a good impression of the reliability and efficiency of this service in Malta.

Books Consulted:

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- II. Hatch D., Svenson E., . . . Current Topics in Anaesthesia Series V
- III. Rickham P., Johnstone J., . . . Neonatal Surgery.
- IV. Rees G. and Gray T., . . . Trends in Current Practice 1981.