

ANAESTHETIC MANAGEMENT OF A CASE OF NEONATAL TETANUS UNDERGOING LAPAROTOMY FOR INTESTINAL OBSTRUCTION

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SUMMARY

Aim: To highlight the importance of committed efforts in pre- and postoperative anaesthetic management of very ill neonates.

Case Report: General anaesthesia was administered for laparotomy in a five day old baby boy with intestinal obstruction and neonatal tetanus, who had an anaesthetic risk of (ASA) 4^E.

Ante-natal care and delivery were carried out by a traditional birth attendant.

He was resuscitated with 4.3% dextrose in 0.18 saline until stable pulse, blood pressure and urine output were achieved over a six hour period. Antibiotics and anti-tetanus therapy were started in the ward.

The patient was given a diazepam based general anaesthesia with muscle relaxation and manually ventilated with 70% oxygen in air. Oxygen saturation, pulse, temperature and blood pressure were maintained at stable levels during the operation which lasted two and half hours. Early recovery of spontaneous respiration was encouraged, in the absence of ideal postoperative respiratory support.

Manual respiratory assistance was continued for another 5hrs postoperatively before spontaneous respiration was judged adequate. Supplementary oxygen via the nasal catheter was continued until his discharge to the ward on the 23rd day.

Conclusion: When surgery is the best management option, the patient should not be too ill for it. It is, however, important that the best achievable clinical condition within the safe moments be realized.

Key Words: *Neonate, Hernia, Tetanus, Anaesthesia*

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INTRODUCTION

Inguinal hernia is the most common surgical condition in childhood, with about 36% occurring in premature babies and, 24% being incarcerated.¹ In general, repair of inguinal hernia poses little surgical problem but, in the neonate, it can be a challenging operation². This challenge would be much more when there is an associated medical problem such as neonatal tetanus.

Tetanus is a preventable disease, now rare in developed world but still frequent in the third world countries where it remains a major cause of death especially in the very young ages. Neonatal tetanus accounted for 18% and 30% of all neonatal deaths in Ibadan³ and Port-Harcourt⁴, Nigeria in 1984 and 1986 respectively. A cluster survey in Kano, Nigeria gave neonatal death due to neonatal tetanus as 20.6 /1000 live births, or about 67% of all neonatal deaths.⁵ Morbidity and mortality are therefore expected to increase when tetanus occurs in association with other clinical problems such as incarcerated inguinal hernia.

Adequate preoperative resuscitation and appropriate antibiotic treatment prior to general anaesthesia with muscle relaxation is our technique of choice in the management of these patients. Arrangement for postoperative respiratory support and prolonged oxygen therapy are made for management of postoperative tetanus spasms and postoperative pain.

This report aims to emphasize the need for detailed preoperative preparations and postoperative care of very ill neonates as well as highlight the benefits of the combination of an anaesthetic agent with anticonvulsant properties and muscle relaxation

CASE REPORT

A baby boy, aged 5 days and weighing 2.9kg with intestinal obstruction due to incarcerated inguinal hernia was presented for laparotomy. Ante-natal care and delivery were carried out by a traditional birth attendant. The baby became

febrile on the third day of life and subsequently went refused feeds. The abdomen gradually became distended and tense over the next twelve hours. He became repeatedly jittery early on the fourth day which was then followed a few hours later with tonic spasms. The baby was taken back to the birth attendant who advised a medical attention at the University of Nigeria Teaching Hospital. Emergency laparotomy was planned as soon as the baby was admitted.

Anaesthetic review showed a highly irritable baby with rigidity and tonic spasms in all the limbs triggered by minimal stimuli. He had a septic umbilical stump and was moderately dehydrated with a total urine output of 12mls over 24 hours, a pulse rate of 160/min, temperature of 37.2°C and a respiratory rate of 62/min. The packed cell volume was 29%. He was re-hydrated with 40mls of 0.18% saline in 4.3% dextrose over the first hour, in 2ml boluses and 4mls/kg/hour over the next five hours. The urethra was catheterized with a size 6 Foley's catheter. Anti-tetanus serum 10,000 IU, tetanus toxoid 0.5mls stat, diazepam 1mg 6hrly, ampiclox 125mg 6hrly and metronidazole 75mg 8hrly were commenced in the ward. Following the resuscitation, the pulse dropped to 135/min, respiration down to 35/min. and dehydration was judged as mild. He was assigned a clinical status of ASA^{4E} and 100mls of blood was donated by the mother for transfusion during surgery.

Anaesthetic management

Surgery was performed under general anaesthesia on the second day of admission. Following a dose of 0.01mgkg⁻¹ injection of atropine for pre-medication, intravenous infusion of 4.3% dextrose in 0.18% saline was started at a rate of 0.5mlsmin.⁻¹ which also supplied calorie at about 5mgkg⁻¹min.⁻¹. The theatre air-conditioner was turned off and patient's body wrapped with warm blanket. He was then pre-oxygenated for 5minutes

using the Jackson Rees modified T-piece circuit and the face-mask. Anaesthesia was induced with 0.3mgkg^{-1} of diazepam. Respiration was gently assisted and a dose of 0.05mgkg^{-1} pancuronium bromide administered. Endotracheal intubation was achieved with size 2.5 portex tube. Intermittent positive pressure ventilation was manually delivered using 70% oxygen in air. Aliquots of diazepam and ketamine totaling 4mg and 20mg respectively were used to maintain anaesthesia.

At surgery a thorough cleaning of the septic umbilical stump was done and a sub-umbilical transverse incision through which the herniated loop of bowel was extracted from the hernia sac was made. Following abdominal toileting and warming with hot mops, the trapped segment was found to be unviable and was resected and anastomosed. Estimated blood loss was 65mls and a total of 70mls of blood was transfused

Arterial oxygen saturation and pulse rate were maintained at 100% and 135-142/min. respectively all through the surgical procedure. Blood pressure measured using the New-born cuff (7.7cm-10.5cm) of Tycos (Welch-Allyn) aneroid manometer ranged between 50/30 and 60/30mmHg.

Controlled ventilation was gradually converted to manual assist ventilation as patient's respiratory efforts showed signs of recovery at the end of the operation. At the end of the 150 minute surgery, residual muscle relaxation was reversed with 0.01mgkg^{-1} of atropine and 0.03mgkg^{-1} of neostigmine over 10 minutes. Respiratory assistance was continued as patient's respiration showed moments of apnoea, until 5hrs post-operatively when spontaneous respiration was able to maintain steady arterial oxygen saturation of 100% with inspired oxygen concentration (fiO₂) of 0.5. Patient was then transferred to the intensive care unit (ICU) with the endotracheal tube in situ, spontaneously breathing air-oxygen mixture initially at fiO₂ of 0.5 through the T-piece. The fiO₂ was gradually reduced over the next 5hrs to

0.3. The patient was extubated 48 hrs postoperatively in the intensive care ward.

Tonic spasms continued postoperatively and were managed with intermittent boluses of diazepam 0.01mgkg^{-1} and manual respiratory assistance. Oral sips were commenced on the fourth day post operatively and the intravenous fluid therapy was discontinued on the 16th day postoperatively. Patient was discharged to the paediatric ward on the 23rd post-operative day when there was no further evidence of spasms and the clinical state remained stable. He was discharged from the hospital on the 44th day with a weight of 3.5kg.

Discussion

General anaesthesia and operative surgery in the neonates are potentially difficult and risky^{2, 6}. Where possible these procedures are delayed to allow for gain of weight. But in emergency situation, or where there are more than one disease processes, as was the case in our patient, urgent surgery and anaesthesia become inevitable.⁷

Inguinal hernia is the most common surgical condition in childhood, with more than half occurring in infancy, but relatively more in pre-term and low birth-weight neonates⁸. Frequently, such tender babies are first seen when the hernias are already complicated. Incarceration is one of such complications and once present, general anaesthesia and surgery can no longer be safely delayed. Although incarcerated inguinal hernia is very common, reports of its association with neonatal tetanus is scanty.

Severe sepsis is a major health problem in children. The highest incidence occurs in the neonates and low birth weight babies. Early recognition, aggressive resuscitation and goal directed treatment improves the outcome.⁹ A cluster survey in Nigeria identified poor cord management as a major cause of sepsis in the neonates.⁵ The usual practice of cutting and tying the cord with non-sterile knife and

thread respectively has continued to promote these infections in our rural communities. This was the case with our patient whose delivery was supervised by the traditional birth attendant.

Tetanus is a bacterial infection caused by a gram-positive bacillus –*Clostridium tetani*. It is endemic in the third world countries and remains a significant cause of death, especially in the new-born¹⁰. The incubation period is 2-60 days, with an average of about 15 days in 90% of cases. This incubation period is inversely related to the severity of the disease.

Two kinds of toxins are usually produced by *Clostridium tetani*, – tetanolysin which causes local tissue damage around the site of infection, and tetanospasm, which is capable of diffusing and binding to nerve terminals all around the body giving rise to the clinical symptoms. These symptoms can be summed up into- rigidity, muscle spasm and autonomic dysfunction.¹¹ Reflex spasms, the most common presentation, could be spontaneous or provoæative, and may be extremely painful and endanger respiration.

The short incubation period (<5 days) seen in our patient was expected to denote unfavorable prognosis. The rigid and rather stiff presentation, the frequent spasms, and the respiratory rate of 62b/min. would put our patient at Albett grade 11-111.¹² Albett grade 11-111 in a neonate with incarcerated inguinal hernia and intestinal obstruction increased the anaesthetic risk to ASA^{4E} which meant a great challenge to the anaesthetic management of what would have been a straightforward case.

The anaesthetic management was intended to at least retain the overall stability of the patient during the operation. This goal was achieved by keeping the patient warm all through the operation, supplying him with adequate calorie, taking off the work of breathing from him and prompt replacement of blood loss. These were made possible by the technique that involved adequate sedation, muscle relaxation, controlled ventilation and post-operative respiratory assistance. These were preceded by formal treatment of *clostridium tetani* infection with

metronidazole, a cheap and available agent in our locality which have been found to be very effective against the bacteria¹³; neutralization of the unbound toxins with human tetanus immunoglobulin; active immunization with tetanus toxoid in an attempt to generate antibodies against the bacteria; and the use of diazepam to control the spasms and rigidity.

General anaesthesia for neonatal herniotomy have been associated with post-operative apnoea, bradycardia, and the need for respiratory assistance.¹⁴ Apnoeic attacks were seen and managed in our patient with respiratory assistance. No evidence of bradycardia however was seen probably because of high sympathetic tone usually associated with clinical tetanus. General anaesthesia remains the technique of choice for surgical management of neonates with tetanus because it allows judicious use of sedatives and relaxants both of which are essential in the management of clinical tetanus and, controlled ventilation which remains mandatory in neonatal anaesthesia. Diazepam was used for induction, maintenance of anaesthesia and post-operative sedation. High doses of diazepam may be required¹⁵ but a total of 4mg, was enough for the anaesthesia and the first 5hrs of post-operative sedation in the 2.9kg neonate.

Muscle relaxation was achieved with pancuronium bromide, which was used both for intubation and maintenance. Although pancuronium is a known inhibitor of catecholamine re-uptake which worsens the usual autonomic instability associated with tetanus, we did not notice any untoward effect with its use. Vecuronium^{16, 17} and atracurium¹⁸ would appear to be more appropriate relaxant to use in tetanus, but they were not immediately available.

Severe cases of tetanus frequently require admission in the intensive care unit and, almost invariably so, when complicated by surgery. However the period of stay in ICU is not significantly influenced if surgical stress

and healing do not go beyond the period of clinical manifestation of the tetanus.

Surgical maneuver may further disseminate the infection in addition to the usual stress of the surgery thereby worsening the patient's outlook. Appropriate antibiotic therapy just before surgery tends to limit this dissemination. Anaesthesia on the other hand may be required for a long period in a patient for sedation and control of spasm, with resultant weaning problems. Prolonged oxygen therapy in newborns and associated retrolental hyperplasia is also a well known clinical condition. The use of appropriate inspired oxygen concentration at any stage of the management and, weaning patients early enough to assist ventilation tend to prevent these complications.

The patients who recover from the disease usually spend 3-5 weeks in the ICU. The 21 day stay of our patient in ICU was believed to result from prompt treatment of the infection, good respiratory support and early enteral feeding. Such early feeding has been associated with lesser complications, and is cheaper.¹⁹

Conclusion

No neonate is too ill to undergo anaesthesia once surgery is the best clinical option. Balanced general anaesthesia with muscle relaxation is the technique of choice for management of tetanus patients at surgery. Preoperative hydration, calorie supply and prophylactic antibiotic therapy should always be carried out before operation. Intra-operative temperature control and strict maintenance of fluid balance are essential for success of the procedure.

Anaesthetic agents with anticonvulsant properties are most beneficial for both intra- and post-operative management. Respiration must be controlled intra-operatively and electively so in the postoperative period, followed by assisted ventilation. Arrangements must be made for prolonged postoperative oxygen therapy and early enteral feeding.

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