PRACTICE IN THE INTRAOPERATIVE PERIOD OF SURGICAL CORRECTION OF A “SKY OPEN” MYELOMENINGOCELE IN UTERO

Atuação no intraoperatorário da correção cirúRGica de mielomeningoceles a “céu aberto” intraútero
Práctica intraoperatoria de la corrección quirúrgica de mielomeningocele a “cielo abierto” en útero

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ABSTRACT: Objective: To report the experience of a nurse’s practice in the intraoperative period of meningomyelocele surgical repair in the open in utero. Method: Report of a practice experience in a private hospital in São Paulo. Results: Nurses have a fundamental role in anticipating and providing materials and equipment for surgery, in following up the patient to admission in the Operating Room, and in assisting the surgical anesthetic procedures. Conclusion: Primary factors for the surgery success include field staff’s knowledge and domain about the phases of surgery, and being prepared to care for the pregnant patients, and to recognize the possible complications involving the mother and fetus. Keywords: Meningomyelocele. Spinal dysraphism. Fetal monitoring. Anesthesia. General surgery.


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INTRODUCTION

Meningomyeloceles (MMC) are birth defects of the closure of the neural tube. This congenital malformation affects mainly the lumbosacral region. Studies have shown that hydrocephalus occurs in 80 to 90% of cases¹, involving also the overlying tissues to the spinal cord, the vertebral arch, the dorsal muscles, and skin. It is known as spina bifida and classified as occult and cystic, with two main forms: the meningocele and MMC².

The formation of the neural tube occurs in two stages: the first of which happens during the fourth to fifth week of pregnancy, called primary neurulation, which is the formation of the neural tube from the high lumbar region up to the cranial region, and the second occurs around the seventh week of pregnancy and is the formation of the neural tube of the lumbar and sacral region, between 24 and 28 days after conception. The neural plate closes, originating the neural tube. Incomplete premature closure results in spina bifida³.

The causes that lead to this malformation are still uncertain⁴ but are associated with genetic and environmental factors, such as: maternal diabetes, zinc deficiency, alcohol intake during the first trimester of pregnancy, food contaminated by pesticides, anesthetic agents, and anticonvulsant drugs, among others, with the main factor being the lack of folic acid². As a result, MMC generates sequelae that may be significant, such as motor impairment in varying degrees, skeletal deformities, urinary and/or bowel incontinence, and hydrocephalus with consequent Arnold–Chiari II malformation, which is an abnormality characterized by permanent herniation of the bulb and cerebellum⁵.

Diagnosis can be identified prenatally, thanks to the development of fetal medicine⁶. Noteworthy are the high-resolution ultrasound (US) examination and biochemical tests [measurement of alpha-fetoprotein in plasma in amniotic fluid (AF) and acetylcholinesterase]³⁷.

Thus, the advantage of early diagnosis led to an improvement in fetal medicine, with a new surgical technique for repair of MMC. Open in utero surgical repair has been performed in pregnant women with gestational age (GA) between 21 and 27 weeks. This aims to reduce the consequences resulting from neural tube defects (NTDs)³⁷. Studies show that the earlier the NTD is repaired, the lower the degree of sequelae⁸⁹.

The first procedure report with fetal medicine was conducted in 1963 by William Liley, who made a fetal blood transfusion, and in 1981, there was a hydronephrosis correction⁹. The first model with surgical technique for MMC correction with fetal repair was created by Michejda in 1984⁴. The technique for the open in utero MMC repair is currently being performed in Latin America by its precursor, Professor Antonio Fernandes Moron¹⁰. It is performed only in two hospitals in the city of São Paulo, Brazil, one is private and the other is public.

The in utero MMC surgery is classified as an open procedure, involving laparotomy and hysterectomy. The incision is performed in accordance with the position of the fetus, which may be anterior or posterior. The AF is extracted and stored in a sterile container and heated to be reinfused at the end of the procedure. This procedure involves two medical specialties: fetal medicine and neurosurgery⁶. Studies show that the in utero repair of MMC decreases the occurrence of hydrocephalus and brain injury and enables an improvement in motor function of the lower limbs⁵.

There are some criteria for in utero surgical repair, such as careful assessment of each case, GA, care with anesthesia (for this surgical technique involves the mother–child binomial)⁷, well-trained and qualified medical and nursing staff, intensive care unit (ICU) backup, and blood bank.

The intraoperative care practices by nurses and all the nursing staffs in MMC repair surgery are of utmost importance, but there is a lack of description of these actions in the publications of this area. Thus, considering the profile of these surgical patients, the mother–child binomial, we believe this study may contribute to the improvement of nursing care in this period.

OBJECTIVE

This study aimed to describe the intraoperative role of nurses in the open in utero surgical repair of MMC in a private hospital in São Paulo, Brazil.

METHOD

This is a descriptive and an analytical experience report study, aimed at seeking scientific information underevidenced by nursing. It gives an account of the practice of a nurse who works during surgery, having the opportunity to experience the open in utero surgical technique of MMC repair in a private hospital in São Paulo. The appreciation of the experience
report method is based on the premise that problems and practices can be improved through the description and analysis of objective and direct observations.

The study describes the experience of a nurse who works in the Surgical Center (SC), dealing directly with pregnant patients admitted for the open in utero MMC repair in a private, midsized hospital, located in São Paulo, which has been offering the technique since 2011. In this hospital, there is only one surgical team that performs this procedure, consisting of fetal medicine and neurosurgery specialists. The aim is to demonstrate the improvement and evolution of the nursing staff, in conjunction with fetal medicine, in the admission of these patients, in the care for the mother–child binomial in the operating room (OR), in the nursing practices, in assistance to the anesthesiologist and surgical teams involved, and in the preparation for any complications, aiming to improve the care provided to these patients.

**RESULTS**

This experience report is based on the experience of the first author as acting nurse in the SC of a midsized private hospital in São Paulo, performing the open in utero surgical repair of MMC. The first experience with this surgical technique occurred in the company of a fetal medicine doctor in 2011. Before scheduling the first surgery with the intrauterine correction technique, a team member (fetal medicine) went to the SC to guide and show the nurses how the open in utero surgery technique be performed in pregnant patients and to describe the materials needed, surgical time, and the teams involved. Everything was presented in slides based on a surgery that was already performed at another institution by the same team.

The role of the nurse was to predict and provide all the materials and equipments needed for a surgery, to follow-up the patient in the admission to the SC, and to assist during surgical anesthetic procedures, acting in the OR.

The work dynamic includes, initially, requests for materials, namely: obstetric surgical drapes and double-barrier disposable aprons, latex-free gloves, specific instruments (CS and delicate neurosurgery boxes), fibrin glue and spray device, US device, thermal blanket, wedge, heel protectors, and basic materials for surgeries (gauze, bandages, tanks, domes, surgical thread, etc.). It is imperative that the reservation is made for adult ICU and in the blood bank for blood products.

On the recommendation of the surgical team, the patient is admitted on the day before the surgery in order to receive the preoperative visit, both from the anesthesiologist and the nurse, to start preparations for the surgery. Blood typing is performed, laboratory tests are collected, medications are administered according to prescription, and the reservations for the adult ICU and blood products are made. The GA profile of patients undergoing the open in utero surgical treatment of MMC varies between 25 and 26 weeks of gestation.

The arrival of the patient to the SC takes place 30 minutes before the scheduled surgery, and personal information is confirmed (full name and date of birth), and a picture is taken, which is transmitted to the OR through a panel, which enables the display to everyone involved in the surgery. At the end of the proceedings, the documents are printed with the photograph of the patient. Thus, it is possible to increase the efficiency in the safety of the patient (correct patient and medical staff).

The SC of the institution where the procedure is performed has a preanesthetic room, where the team makes the patient’s first admission in the Surgical Block. The medical records, test results, and reservations are checked, and signatures in terms of consent (anesthetic and surgical) are confirmed. Venipuncture is performed, and premedication is administered, if prescribed by the doctor. The patient remains in the preanesthesia room until the arrival of all members of the surgical team and the preparation of the OR.

The patient is then transferred to the OR, accompanied by a nursing technician (circulating nurse), with the help of a nurse. The safe surgery checklist begins, which is performed before induction of anesthesia, confirming the patient’s full name, the procedures to be performed, the report of allergies, the risks of airway difficulty and bronchoaspiration, and blood loss beyond the expected (up to 500 mL). Maternal monitoring follows, initially with pulse oximetry, cardiac monitoring, and noninvasive blood pressure (NIBP).

An obstetric US examination is performed by the fetal medicine doctor, to observe the fetal positioning, vitality, and fetal heart rate (FHR). A wedge is placed on the patient’s right flank region, in order to reduce the burden on large vessels and avoid hypotension, given that the position for surgery is the supine–horizontal position.
The anesthesiologist performs another peripheral venous puncture with a caliber catheter (14 or 16 G), followed by combined anesthesia, which may be general, spinal, or epidural and general. Then, monitoring is completed with the performance of capnography; a heated thermal blanket is used on the patient’s upper body (thorax and upper limbs), in order to reduce or prevent postoperative hypothermia.

To contribute to the prevention of surgical site infection, degermation is performed on the abdominal and pelvic regions. The urethral catheter is inserted for water control during the intraoperative and postoperative periods, and the dispersive electrocautery plate is positioned at the nearest site of surgery, usually the thigh area.

Before the surgery starts, the second part of the checklist is performed, with the confirmation of the presence of all the people involved in the surgery, what procedure will be performed, surgical time, availability of tests and materials in the OR, and if the dose of antibiotic prophylaxis was administered. Throughout the preparation period, already intraoperatively, the nurse’s role is dynamic, helping the patient, the anesthesiologist, the surgical team, and the circulating nurse.

The surgery itself begins with the skin incision, followed by hysterotomy and extraction of the AF, with the aid of a latex-free vesical probe (type Foley 14). The AF remains stored in 60-mL syringes in buckets, immersed in a 0.9% saline solution (SS), and heated, on the surgical table. The procedure is guided by US examination for fetal monitoring. The fetus is exposed and positioned so that the neurosurgeon can perform the repair of MMC. To this end, the uterus is sutured using fibrin glue with the spray device. The AF is reinfused into the uterus, repositioning the uterus in the abdominal cavity for closure by plans and the completion of the dressing.

At the end of the surgery, the third step of the checklist is performed, with confirmations of the number of used compresses, needles, and surgical instruments and identification of parts or tests that were requested during the intraoperative period. The patient is then extubated by the anesthesiologist and transferred to the previously reserved bed in the adult ICU, where they are monitored (pulse oximetry, NIBP, and cardioscopy) and supplemented with oxygen if necessary. On transfer, the patient is always accompanied by a circulating nurse (nursing technician), by the nurse, and by the anesthesiologist.

It is observed that, along the working trajectory with this particular procedure, there is a need for the nursing staff to be ready for early delivery due to stimulation of the uterus and the profile of GA (24–26 weeks). Therefore, to prepare the OR for the open in utero MMC surgery, neonatal resuscitation materials should be organized, and the neonologist doctor and a midwife must be forewarned, if necessary, and a reservation must be made with NICU in the case of premature labor.

In the course of acting as nurses, being present at nearly a hundred open MMC repair surgeries, only one premature birth that resulted in fetal death was experienced, but no hospital infection was recorded. In addition, over the years, there has been a constant improvement in the surgical team’s ability, with consequent reduction of surgical time. Another key factor for the success of the surgery is the better preparation of the nursing staffs, in order to care for pregnant patients who were admitted to the SC for the open in utero MMC surgery. Through the report, this procedure can be identified as a highly complex surgery.

It is shown that, by means of quality indicators from 2011 to 2013, there is a significant increase in the number of in utero MMC surgeries, compared with the conventional repair of MMC, employed in newborns, in the first 24 hours after delivery.

**DISCUSSION**

In the recent years, there have been important advances in perinatal medicine. There are many procedures performed during pregnancy, from minimally invasive (amnioscopy, cordocentesis, and aspiration of cysts) to highly complex surgery (tracheal occlusion with inflatable balloon in cases of diaphragmatic hernia and open surgery, such as in utero MMC repair) with the intention of treating or ameliorating the chance of fetal survival. Currently, monitoring the evolution of complex fetal surgery in Brazil is a challenge.

Owing to the high complexity of in utero MMC surgery, a preoperative evaluation is carried out, thus justifying the admission of the patient on the day before the surgery. Given this, Resolution 1363/1993 of the Brazilian Federal Council of Medicine (CFM), in its Article 1, paragraph 1, states that “prior to any anesthesia, it is necessary to know in advance the clinical conditions of the patient to be submitted to it, and the anesthesiologist shall decide on the desirability or not of the practice of anesthesia, in an indisputable and non-transferable fashion.” Therefore, preoperative evaluation is needed to assess the risks and possible preventable complications.
During in utero fetal surgery, maternal monitoring is required, which includes pulse oximetry, NIBP, cardioscopy, capnography, and evaluation of neuromuscular blocking by acceleromyography; fetal monitoring is also required, through US examination, which evaluates fetal vitality, FHR, placental location, fetal position, and uterine contractility.

Antibiotic prophylaxis is performed, in order to avoid or decrease the infection rate in the postoperative period, although the author did not find any epidemiological studies related to postoperative infection in patients who underwent the in utero MMC surgical technique (and did not witness any cases that evolved with infection), unlike the conventional MMC repair techniques, which demonstrate a high incidence of postoperative infection in other studies.

However, anesthesia for in utero fetal surgery involves the mother and fetus. Therefore, the anesthesiologist must know the physiological changes of pregnancy and the effects of anesthetics on the maternal and fetal organisms. Anesthetic agents, given to the mother, can interfere with the fetus, directly through the placental passage or indirectly by interfering in maternal cardiovascular and respiratory systems.

General anesthesia is the technique that offers greater security for fetal surgery under hysterotomy, allowing control of uterine relaxation, ventilation, oxygenation, and blood pressure. Therefore, it has become the method of choice for in utero repair surgery, in combination with local anesthesia, which can be achieved by epidural puncture and contributes to postoperative analgesia.

Prenatal in utero MMC repair involves laparotomy and hysterotomy. The incision in the uterus depends on the position of the fetus, may be anterior or posterior. AF is removed and stored in a sterile container (with antibiotic or not) so that, at the end of surgery, it can be reinfused and supplemented with a warm 0.9% SS, in case part of the AF was lost during the intraoperative period. The fetus is positioned so that the MMC repair can be performed; fetal monitoring is continuous, through US examination. After surgical correction, the closure of the uterus and amniotic membranes begins, using fibrin glue as a seal.

A major challenge or obstacle is the risk of preterm labor, resulting from uterine stimulation and contraction, caused by manipulation and incision of the uterus, and may also lead to detachment of the placenta, which reduces placental blood flow and leads to fetal hypoxia. Therefore, the prevention and treatment of preterm labor are continuous and crucial to the success of in utero MMC surgery, with tocolytic drugs being administered pre-, intra-, and postoperatively. It is noteworthy that studies show that GA for in utero surgical repair of MMC have a variability between 20 and 26 weeks of gestation.

The in utero MMC repair technique cannot be compared with others, because there are no studies comparing their benefits. However, studies show that children who underwent in utero fetal MMC surgery showed improvements in motor function of the lower limbs, decreased occurrence of hydrocephalus due to Arnold–Chiari II malformation, in head injuries, and in the use of ventriculoperitoneal shunt.

Fetal surgery is in full development, with new techniques and approaches, and to increase its success rate, further studies and improvement of the professionals involved are needed, so that they are able to recognize the possible complications associated with new surgical techniques.

In utero fetal MMC surgery is still performed in a few surgical centers, and its success depends on a highly qualified and trained multidisciplinary approach, which stresses the role of the nurse working in the OR and its entire staffs, including the circulating nurse.

Starting from the point that, in utero MMC surgery is highly complex and involves two individuals, health-care professionals, especially the nursing staff, should be able to care for the pregnant patients in the OR, SC, and ICU and to recognize the possible complications related to this procedure, the main interventions, and appropriate conduct. One form of training is to provide knowledge to all individuals involved. Hence, there is an importance of this report, because no studies were found in the national literature, which were conducted by nurses during their performance in the care to the mother–child binomial during the open in utero surgical repair of MMC.

Many ethical issues related to the benefits of the open in utero surgical repair of MMC will still be identified and discussed, but a better future for people with MMC can be demonstrated through studies.

It is worth mentioning that in utero fetal surgery is a recent development in Brazil and performed in a few health institutions. The nursing staff’s responsibilities are continuous and face a great challenge in following this complex evolution of fetal medicine. We consider this experience extremely rewarding, being able to contribute, as a nurse, to this advancement in medicine and to improve the quality of life of the children affected by this serious disease. This enhancement extends to the future child’s entire family.
CONCLUSION

This experience report allowed to present and discuss the role of a nurse in the intraoperative period of the open in utero surgical repair of MMC in a midsized hospital in São Paulo, Brazil, which has been offering this technique, since 2011. Emphasis is given to the intraoperative care by the multidisciplinary team to the mother–child binomial. It shows the importance of preoperative guidance, the nursing practice from the preparation of the OR, the admittance of the pregnant patient, positioning, anesthesia, the surgery itself, the referral to the ICU, and the need for recognition of possible complications, using, at all stages, the recommendations contained in the safe surgery protocol, aiming at the safety of the mother and fetus.

REFERENCES


