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Utilization of Laparoscopic Wound Retractor for Extremely Low Birthweight Neonatal with Gastroschisis: Case Report and Literature Review

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ABSTRACT

Background : Gastroschisis is one of most devasting congenital anomaly. Cases in high-income countries are better due to early detection with early intrapartum interventions, somehow unable to apply in low-middle-income countries

Case: Slightly preterm female neonate born with gastroschisis and extremely low birthweight at 1400gr in a primary care hospital. APGAR score of newborn was well, but due to limited resourced patient was transferred to referral hospital for pediatric surgery care. Patient then underwent emergency surgery, but bowel was matted and not reducible, so laparoscopic wound retractor was applied as alternative to Silastic Silo. Bowel was planned for staged reduction.

Discussion: Staged reduction is one of considered treatment for gastroschisis. The application of silastic silo was no longer available, notably in low-middle income countries. This started an idea to modify the utilization of silo by using other sterile supplies which is possibly able to close. The use of the wound retractor was safe in contact to viscera and skin as commonly used for laparoscopy. Hence application in low-middle income countries was not yet much known.

Conclusion: The utilization of wound retractor for temporary closure of gastroschisis can be considered whenever primary closure was not applicable and silastic silo was not available

Keywords: *Extremely Low Birthweight, Gastroschisis, Low-Middle income country, Neonate, Wound Retractor.*

1. INTRODUCTION

Gastroschisis is a congenital anomaly with abdominal wall defect and protrusion of bowel outside the abdomen. This congenital anomaly is currently increasing with reported approximately 1 case in every 4000 livebirths. Cases are increasing and related with early age pregnancy and other high-risk pregnancies. Gastroschisis is currently well-managed in high income countries due to early detection. Yet in low-middle income countries gastroschisis remained a great challenge[1].

Gastroschisis is not just about a protruded bowel trough the abdominal defect. The defect and the protruded viscera served as one port of entry of certain infections which leads to neonatal sepsis. Neonatal sepsis is responsible for more than half mortality of gastroschisis, which sepsis itself occurred about 44.6% of all gastroschisis patient in a tertiary and complete equipped hospital in a high-income country. This statistical data may be more obvious in low-middle income country where early treatment of gastroschisis was extremely limited. Lack of infection control and late treatment of gastroschisis are challenges in low-middle income countries regarding gastroschisis. Exposure of the viscera with other organ increases risk of infections, increases water loss, and fragility to hypothermia, which all would be fatal and lethal in neonates[1,2].

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Late closure of gastroschisis are well accepted all around the world, but temporary closure of the viscera may benefit in preventing entry of infections. Temporary closure followed with staged-closure of gastroschisis widely known with silastic silo. Yet in some limited resource center, silo was not available. Some could not provide silo in their centers. This encouraged the utilizations of many other alternatives of silo in closure of gastroschisis. Some have tried using urine bags, blood bags, sterile hand gloves, plain gauzes, and many others[3]. This article presented an alternative using wound retractor for temporary closure of gastroschisis.

2. CASE

35-weeks gestational age newborn was born with gastroschisis in a primary hospital of a low-middle income country. History on antenatal care and ultrasound screening was only conducted by midwife and general practitioner, none with obstetrician. History of nutritional supplementation during pregnancy was not routine, yet parent was in low economic status and unable to fulfil daily needs. The female neonate was born trough vaginal delivery with approximately 1400 grams of birthweight and was crying directly after cord clamping. No reports of cyanosis or respiratory distress after delivery was not recorded. APGAR Score was noted 8/9.

Several bowel loops were then observed eviscerated outside the abdominal cavity as gastroschisis as pictured in Figure 1. Abdominal defect of gastroschisis was recognized only approximately 3.5cm long, but number of bowel loops was plenty. First meconium defecated was not recorded. Neonate was stable, but then planned for transfer due to limited facility and specialty. The gastroschisis was then covered by sterile plain gauze upon waiting for transfer.

Figure 1. Clinical pictures of very low birthweight preterm neonates born with gastroschsis in minimal access hospital

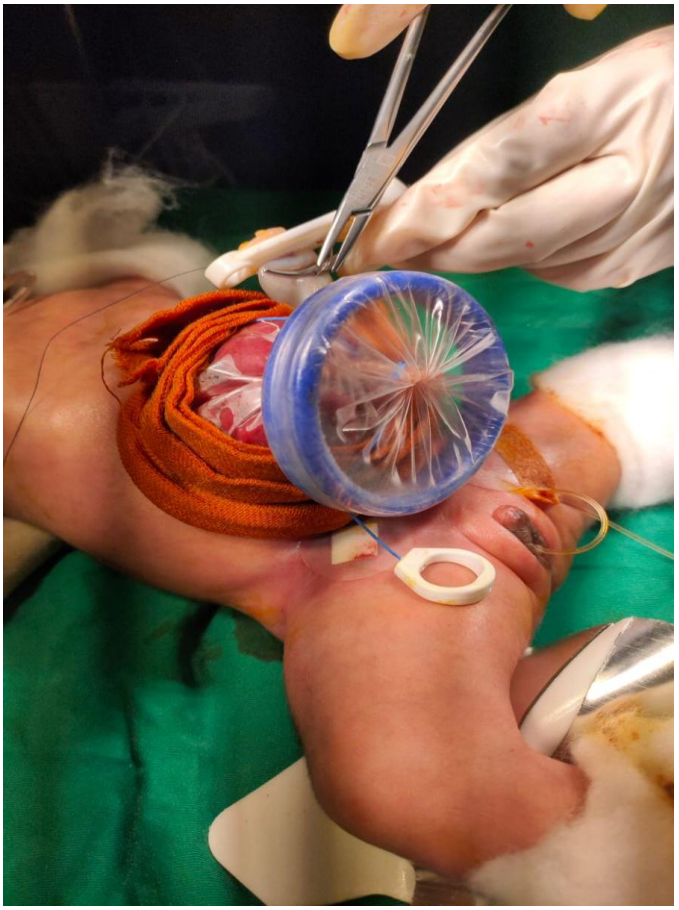
Patient was then arrived in a referral hospital with pediatric surgery care approximately 24 hours after delivery. The bowel loops were observed matted and edematous already. An emergency surgery was conducted for the newborn, but bowel loops was not mobile enough for primary closure. A staged closure was chosen using a laparoscopic wound retractor (Sejong Medical®). Defect was not enough for band insertion, yet a midline extension of defect was done for insertion of the wound retractor alongside with the bowel loops into the wound retractor. After dilatation of the internal band of the wound retractor, extension wound was repaired using Prolene 4/0 sutures. External aspects of the wound retractor had made pressure and preventing gap between defect with the wound retractor, yet suture not required.

Outer band of the wound retractor then twisted thoroughly as proximity to the abdominal wall, without increasing abdominal pressure. At the limit the wound retractor twist was the sued by suture to prevent twisting-back. The peripheral of the wound

retracted then covered by plain gauze soaked with povidone iodine to prevent infections as depicted in Figure 2.

Patient was then transferred to the NICU for intensive observation and staged reduction. Unfortunately, patient was deceased 12 hours after surgery due to uncontrolled sepsis.

Figure 2. Application of wound retractor for laparoscopy in gastroschisis as temporary and staged closure



3. DISCUSSION

Gastroschisis is known as a congenital malformation of abdominal wall defect which causes herniation of abdominal viscera without any covering. This anomaly occurred since in-utero where failure of abdominal wall closure occurred. This may be related to teratogenic exposure, rupture of amniotic membrane, umbilical vein anomaly, abnormal embryonic folding, and may other theories. Main mechanism is most likely when physiological herniation of abdominal wall in embryonic development was not followed by reentering to abdominal cavity. This process also followed by rupture of membrane covering the viscera from the umbilicus[3,4].

Incidence of gastroschisis may vary by different reports from 1 per 4000 newborns, to 4-5 in 10.000 newborn. Cases of gastroschisis may vary by places due to advance of prenatal diagnosis and early interventions afterbirth. Some country practiced medical abortion in early diagnosed prenatal gastroschisis associated with other congenital anomalies, reducing incidence of newborn with gastroschisis and reducing mortality rates in gastroschisis[5].

Common challenges in all gastroschisis cases were that most cases presented late with sepsis. Sepsis was a systemic inflammatory response happened when infection. The protruded bowel trough the abdominal defect was known as culprit for port of entry for pathogens. Unlike omphalocele which has higher mortality with associated congenital anomalies, gastroschisis supposed to have lower mortality in high income countries who had better facility and advanced sepsis treatments. However lower-middle income countries struggling in treating gastroschisis as high number of sepsis occurred. This is mostly related to lack of source control on sepsis. This is causes of late deliver to advanced center, or patients was born in limited facility which could not provide temporary closure for the gastroschisis prior to primary repair in an advanced facility. This caused delay in treatment as most known temporary closure are not available in rural areas alongside with unaffordable for certain patients. Early closure of the gastroschisis had proven to have better outcome, so that temporary closure had a vital role in staged closure of the gastroschisis[3,6,7].

Treatment of gastroschisis in higher income countries had shown significant changes in morbidity and mortality. Some

countries had a better pre-natal screening and diagnosis which can easily diagnosed the gastroschisis prior to delivery. Yet delivery done, treatment of gastroschisis can be prepared for advanced treatment during delivery by planned delivery with multidiscipline approach. This resulted in early response and treatment of gastroschisis itself improving outcome. Early prenatal diagnosis played major role in gastroschisis, and some approach by fetal surgeries provides a promising future in prenatal treatment for gastroschisis, where repair of abdominal wall defect can be done even in utero. This practice is still limited in lower-middle income countries to provide adequate prenatal screening and diagnosis, so that most cases of gastroschisis was not recognized before delivery was done[8,9].

Regarding temporary closure of Gastroschisis, several biomaterials and other sterile medical appliances can be used in emergency setting with limited resource to prevent bowel exposure and progression of peritonitis and sepsis. Treatment of gastroschisis may vary from primary suture and closure of gastroschisis. With and without abdominoplasty are considered by size of the defect upon surgery. This primary closure of gastroschisis yet only feasible in complete surgical facility which gastroschisis had been detected prior to delivery and planned with cesarean section with pediatric surgeries available for surgery during the c-section. Unless facility available with this setting, primary closure nearly not feasible in cases of gastroschisis[10,11].

This primary closure for gastroschisis considered as Ex-Utero-Intrapartum-Treatment like procedure or known as EXIT-like procedure for gastroschisis. As newborn delivered trough c-section, neonates was sedated with circulation of mother with no umbilical cord clamping. Surgery performed bedside of mother's c-section by pediatric surgeons very early after delivery. This EXIT-like procedure is considered very early treatment with better outcome due to minimal exposure of bowel. But yet this procedure only available in advanced resource setting, good prenatal diagnosis, and with defect which is minimal with availability for closure[12,13].

One challenge in gastroschisis was that patient was born in limited resources, peripheral health center, and without any precaution of gastroschisis. Those patients are commonly had poor history of ante natal care causing parents not knowing presence of congenital anomalies in fetus, such as gastroschisis. This setting requires time for refer to hospital with advanced pediatric surgery units. Some cases are followed with preterm labors and low birthweight that added morbidities of the gastroschisis. These cases are commonly related to delay in treatment of gastroschisis. Exposed bowel may be one of port of entry for pathogens increasing risk of neonatal sepsis, with further bowel complication related with adhesion and bowel oedema. Hence in limited setting, temporary closure to prevent exposure of the bowel had vital role[7,14].

Standard temporary closure for gastroschisis commonly performed using silastic silo. Silastic silo had been well accepted and manufactured for use in clinical practices of gastroschisis. This silo can be used to cover bowel prior to primary abdominal closure, but also benefits in gastroschisis which is inoperable or large sized which wall defect was unable to be closed with abdominoplasty. Challenge in use of silo in clinical practice and resource limited setting was that silastic silo was expensive and not available in emergency situation. However, silastic silo was known to be discontinued in production. This requires limited resource of setting to substitute the silastic silo use for gastroschisis with material common in daily practices[15,16].

Some alternatives was used such as using bogota bag which is more common in other surgery with inability to close the abdominal wall. This material may be mor common in use than silo, available in adjustable sizes, and widely available in surgical centers. Bogota bag commonly used in adult surgeries either. Hence the bogota bag was not also available in limited resource settings[17].

Use of alternatives in limited settings may be beneficial using daily used medical products. Products such as sterile non-powdered surgical gloves, urine bags, and blood bag may be considered as alternative to silastic silo. However, the scientific literatures regarding these alternatives are lack. There was no study proved safety of these products as temporary closure for gastroschisis. Ability of these products in preventing early neonatal sepsis in newborn with gastroschisis is yet to be determined, and further study may be required[18,19].

One of physiological device in closure of gastroschisis previously considered as the laparoscopic wound retractor. This wound retractor known not to cause damage to intraperitoneal viscera, preventing adhesions, and also easily used and may be applied without any suture for application. This material had a rubber structure that may be dilated intraabdominally, with outer retractor can also dilated extracorporeally. Outer part of the wound retractor will tighten physically with the wall defect, and also helps dilating the defect preventing bowel compression and ischemia. This mechanism is beneficial in helping the process for staged closure for the gastroschisis, as the wound retractor gently and slowly compressed back into abdominal cavity. Final stage was then when the bowel was returned intraabdominally, the wound retractor will be removed followed by primary abdominal defect closure, which is less tension. This was previously also reported using Alexis wound retractor which is may be similar to wound retractor used in our case[20,21].

We reported a case of gastroschisis in very low birthweight neonate with late arrival in surgical center, bowel was not covered well and edematous. Patient was not eligible for primary closure and prepare for staged closure using a laparoscopic wound retractor. Bowel was successfully covered by the wound retractor and went for staged closure, 3 days of exposure had causing severe sepsis which then neonate deceased due to uncontrolled sepsis during stage closure.

4. CONCLUSION

The utilization of laparoscopic wound retractor is considerable for staged-repair of gastroschisis among other alternative closure of gastroschisis. Although primary closure intrapartum was remained superior for outcome, but temporary closure was required as if gastroschisis was not reducible. Among other alternative of silo, wound retractor had the closest physical properties to the standard closure..

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