Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: www.saspublishers.com

OPEN ACCESS

Pediatric Surgery

Gastroschisis Repair Using Amnion Flap: A Novel Approach Compared To Conventional Management with Silo Application

Dr. Tapasya Pandita, Dr. Umesh Bahadur Singh*

Assistant professor, Pediatric Surgery, G R Medical College, Gwalior M.P. India

DOI: 10.36347/sjams.2019.v07i08.030 | **Received:** 14.08.2019 | **Accepted:** 23.08.2019 | **Published:** 28.08.2019

***Corresponding author:** Umesh Bahadur Singh

Abstract **Original Research Article**

The most commonly adopted method for management of large sized abdominal wall defects like gastroschisis is silo application that allows gradual reduction in size of the defect followed by delayed closure and subsequent ventral hernia repair. We compared this conventional technique to a novel technique of amnion flap cover in similar group of patients with large gastroschisis defects, not amenable to primary closure. In our experience, the amnion flap cover is a feasible method with better results compared to silo application as it provides a natural and more stable barrier to exposed viscera, allowing better adaptation and growth of abdominal domain to accommodate the exposed viscera.

Keywords: Amnion flap; Gastroschisis; Silo bag; Umbilical cord; Omphalocele.

INTRODUCTION

Gastroschisis and omphalocele are the two most common congenital abdominal wall defects and are now frequently diagnosed antenatally by fetal ultrasound. Survival of newborns with gastroschisis is significantly higher in high-income countries compared to low and middle-income countries due to inadequate neonatal health care resources [1]. There is also hidden mortality in patients who may never seek medical care or be referred to a tertiary care centre due to the perceived dismal outcomes in certain low-income countries [1]. Gastroschisis outcomes in a middle-income country can be gradually improved through targeted interventions and management protocols [2]. In an effort towards improving the outcome of gastroschisis at our centre, we explored different surgical strategies. We present our preliminary results via this study.

The key surgical principles of gastroschisis management are closure of the defect, prevention of visceral injury and avoidance of abdominal compartment syndrome. It is conventional practice to perform gut reduction and abdominal wall closure with urgency after birth [3] in the operating room and under general anaesthesia for children with smaller gastroschisis. Most common methods employed are an operative fascial closure with sutures and a sutureless flap closure [4]. If primary closure is not possible because of insufficient size of abdominal domain, an artificial pouch or silo is constructed to contain the eviscerated abdominal viscera. The silo pouch closure has not been as satisfactorily successful a method as previously thought due to various cons [5]. Zivkovic SM (1991) first reported the technique of umbilical patch repair for large size defect to negate the effect of increased intra-abdominal pressure [6, 7]. Similarly, Gharib M (1996) reported the use of amnion harvested from the placenta to repair the large size defects [8].

MATERIALS AND METHODS

We compared a unique method of gastroschisis repair using amnion cover to conventional staged repair using a silo bag. Over a period of two years, 12 patients with large gastroschisis were chosen and randomly assigned to two groups after proper informed and written consent for procedure. Those in group *A* underwent repair with amnion flap whereas those in group *B* underwent silo repair. The native amnion cover with Wharton's jelly harvested from autologous fresh umbilical cord stump was used to give a cover to exposed bowel making the defect akin to an omphalocele [Figure I, II, III & IV].

Fig-1: The new-born with gastroschisis

Fig-2: Amnion flap with Wharton's jelly harvested from longer left umbilical cord stump

Fig-3: Exposed bowel reduced and covered with amnion flap, without any raised intra-abdominal pressure.

Fig-4: Flap sutured to margins of defect

At the time of delivery, the cord stump was kept longer, estimated according to the size of the abdominal wall defect and bowel loops received into a sterile polybag. The patient was transferred to the operating room and under general anaesthesia, the contents reduced into the abdominal cavity. The cord stump was then laid open longitudinally and keeping skin attachment intact, tailored according to the size of the defect. This flap was sutured to the margins of the defect with vicryl 4-0 and dressing done using medicated paraffin sheet (Bactigras^{TM}). The repaired area was painted once a day with povidone-iodine. Over the next 3 to 5 weeks, the defect shrunk and epithelised, leaving behind a ventral hernia, which could be repaired at a later age [Figure V].

Fig-5: Post-operative follow up with incisional hernia at the age of 14 months

For the patients in group B, after a failed attempt at complete bowel reduction into the abdominal cavity, a silo (made using a sterile urobag) was sutured to the edges of the defect [Figure VI]. This bag was closed forming a cylinder-like structure and suspended from the overhead warmer for daily reduction of the bowel into the abdominal cavity using the cord clamps or gauze band. The patients in both groups were monitored for urine output, lower limb oedema, respiratory difficulty, signs of sepsis or any other complication.

Fig-6: Newborn with gastroschisis managed with conventional silo application

Statistical analysis was done by comparing the means of both groups using unpaired *t*-test and p value <0.05 was considered significant.

RESULTS

We analysed 14 new-borns with large size gastroschisis (not amenable for primary closure), who were admitted to the Neonatal Surgery Unit over a period of 2 years. They were divided into 2 groups (Table I). One patient from each group was excluded from study due to detection of associated congenital anomaly (Meningomyelocele – 1, Patent Foramen Ovale – 1). The total sample was randomly divided into two groups of 6 each, managed by amnion flap and silo bag application respectively.

Table-1: Demographic data of newborns with Gastroschisis

	Amnion flap (group *A*)	**Silo closure (group *B*)**
Male	3	2
Female	3	4
Total	6	6

Variables (Table II) such as the age of the mothers, gestational age, birth weight, time of surgery and duration of surgery showed similar averages in both groups. The average waiting time for surgery and duration of surgery did not show a statistically significant difference between both groups. We tried to take up every patient of gastroschisis to operative room as early as possible. Only one patient from each group needed the support of mechanical ventilation in the immediate postoperative period. The time taken to start enteral feeds in the postoperative period showed a statistically significant difference between both groups ($p < 0.05$). For the amnion flap group, we were able to start oral feeds early (mean = 6.83 days) after the patient passed stools regularly and nasogastric tube output reduced to nil. The average time of hospitalization was also significantly lower in the amnion flap group compared to the silo bag repair group ($p < 0.05$).

Due to greater peritoneal fluid losses, electrolyte disturbances were seen in a greater number of patients undergoing silo repair (83.4%) as compared to the amnion flap group (33.4%). Post-operative complications were also more commonly seen with the silo application (50%). In group *B*, one patient developed necrotising enterocolitis and another developed perforation peritonitis, both leading to demise in early post-operative period. Another patient in group *B* developed severe bilateral pneumonia and died after prolonged ventilatory support. In comparison, only one patient (16.6%) in group *A* developed infection of abdominal wall margins sutured to the amnion flap leading to neonatal sepsis and demise on 6th post-operative day. From the results in table II, the amnion flap group patients had clearer survival benefits compared to silo application group of patients.

Table-2: Newborns with Gastroschisis (Statistically significant difference p <0.05).

Variable	**Amnion flap (group *A*, n=6)**	**Silo closure (group *B*, n=6)**	**p value**
Maternal age in years (mean)	19.00	19.17	0.8455
Gestational age in weeks (mean)	37.50	37.83	0.6145
Birth weight in kg (mean)	2.1050	2.1167	0.9145
Waiting time for surgery in minutes (mean)	74.00	75.17	0.7832
Operative time in minutes (mean)	65.17	66.67	0.4479
Hospitalisation time in days (mean)	28.50	42.83	0.0001
Time to enteral feeds in days (mean)	6.83	10.50	0.0065
Electrolyte disturbances (n)	2	5	
Post-op complications (n)	1	3	
Need for mechanical ventilation (n)	1	1	
Survival (n)	5	3	

DISCUSSION

Gastroschisis is a frequently encountered congenital anomaly. It causes high neonatal morbidity and mortality and prolonged hospitalization leads to great costs for the health care system. However, there is no consensus regarding management of this malformation. Mode of delivery, gestational age at delivery, the best time for surgical intervention and the technique of surgical repair vary among different health care centres since scientific evidence does not

consistently support any of the therapeutic strategies [9-12].

At many centres, the routine is to perform primary closure in the few hours of life under general anaesthesia, and in an operating room. Some centres carry out the primary repair in the neonatal intensive care unit and use it as the first attempt of correction [10-12]. The Silo is a synthetic bag designed to cover the gastroschisis and is fixed to the abdominal wall, normally the fascia. After placement, viscera are reduced one or two times a day until complete reduction, which usually occurs from 1 to 14 days after delivery. The two types of silo most often used are the preformed (silicon) or the customized (PVC) devices. After finishing the reduction, abdominal wall closure is still necessary. This type of Silo aims at reducing morbidity, diminishing the necessity of neonatal anaesthesia, at least in the first hours of life. Silo placement and delayed closure seem to be especially indicated in cases with viscero-abdominal disproportion due to the risk of compartment syndrome. Despite lacking scientific relevance, many studies have been carried out comparing Silo to primary closure [12]. There is a great variety of study designs, populations evaluated and results obtained.

The technique presented in our study involves closure of the defect, providing a natural cover to exposed bowel loops without compromising the intra-abdominal pressures and without using any exogenous material, making the anomaly more akin to an omphalocele, which is readily manageable. We believe this may be the main reason for the better postnatal parameters studied. In this novel technique, only viscera reduction is performed with widening of the defect until a pressure-free reduction is achieved. The post-reduction defect is closed by amnion flap without any tension on the suture line which considerably reduces the risks of intra-abdominal compartment syndrome and other related complications. This tissue was chosen because it is natural and non-immunogenic with membrane along the Wharton's jelly containing abundant stem cells [7].

Although we have operated on only six cases so far, analysis of postoperative results shows a better outcome using amnion flap as compared to the delayed closure with Silo placement. In our experience, the amnion flap significantly reduced the number of days of nutritional transition and hospital stay. Since the case allocation was random and similar pre and post-operative protocols were applied to both groups, the different outcomes may be related to the new surgical technique described.

We aim to report and compare our initial experience with an innovative and under-reported surgical technique which may be used for repair of gastroschisis. The use of amnion flap proves beneficial compared to primary closure and silo closure. It bypasses the risk of compartment syndrome due to reduction of viscera into a small abdominal cavity. It also provides a natural milieu for the oedematous bowel loops unlike a silo made of synthetic materials. We showed that the amnion flap closure gives a better outcome than the classical silo closure we have been using since long in our unit.

CONCLUSION

Amnion cover harvested from native umbilical cord gives a good and easily available cover for large size defects of gastroschisis which are not amenable for primary closure.

REFERENCES

1. Ford K, Poenaru D, Moulot O, Tavener K, Bradley S, Bankole R, Tshifularo N, Ameh E, Alema N, Borgstein E, Hickey A. Gastroschisis: Bellwether for neonatal surgery capacity in low resource settings?. Journal of pediatric surgery. 2016 Aug 1;51(8):1262-7.
2. Miranda ME, Emil S, de Mattos Paixão R, Piçarro C, Cruzeiro PC, Campos BA, Pontes AK, Tatsuo ES. A 25-year study of gastroschisis outcomes in a middle-income country. Journal of pediatric surgery. 2019 Feb 24.
3. Villela JR, Salinas ML, Navas R. Medical-surgical course of neonates with gastroschisis according to time, abdominal closure method and intestinal involvement: six years of experience. Cirugia pediatrica: organo oficial de la Sociedad Espanola de Cirugia Pediatrica. 2009 Oct;22(4):217-22.
4. Youssef F, Gorgy A, Arbash G, Puligandla PS, Baird RJ. Flap versus fascial closure for gastroschisis: a systematic review and meta-analysis. Journal of pediatric surgery. 2016 May 1;51(5):718-25.
5. Ein SH, Rubin SZ. Gastroschisis: Primary closure or silon pouch. Journal of pediatric surgery. 1980 Aug 1;15(4):549-52.
6. Živković SM. Repair of gastroschisis using umbilical cord as a patch. Journal of pediatric surgery. 1991 Oct 1;26(10):1179-80.
7. Zivkovica SM, Djordjevica M, Milic N, Smoljanic Z, Djuricic G, Pavicevic P, Keserovic B, Stojanovic B. Effectiveness of Wharton's jelly stem cells in gastroschisis repair using the inner surface of the umbilical cord as a patch: long-term results. Annals of Pediatric Surgery. 2015;11(3):173-80..
8. Gharib M, Ure BM, Klose M. Use of amniotic grafts in the repair of gastroschisis. Pediatric surgery international. 1996 Mar 1;11(2-3):96-9..
9. Stanger J, Mohajerani N, Skarsgard ED, Network CP. Practice variation in gastroschisis: Factors influencing closure technique. Journal of pediatric surgery. 2014 May 1;49(5):720-3.

10. Schlueter RK, Azarow KS, Hines AG, Varman M, Abdessalam SF, Raynor SC, Cusick RA. Identifying strategies to decrease infectious complications of gastroschisis repair. Journal of pediatric surgery. 2015 Jan 1;50(1):98-101.
11. Schlueter RK, Azarow KS, Hines AG, Varman M, Abdessalam SF, Raynor SC, Cusick RA. Identifying strategies to decrease infectious complications of gastroschisis repair. Journal of pediatric surgery. 2015 Jan 1;50(1):98-101.
12. Ross AR, Eaton S, Zani A, Ade-Ajayi N, Pierro A, Hall NJ. The role of preformed silos in the management of infants with gastroschisis: a systematic review and meta-analysis. Pediatric surgery international. 2015 May 1;31(5):473-83.