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ANESTHESIA MANAGEMENT ON NEONATAL ATRESIA DUODENUM WITH GASTRIC OUTLET OBSTRUCTION: CASE REPORT

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Abstrak

This case report investigates a 1-day-old male neonate diagnosed with Atresia Duodenum, detailing the complexities of clinical manifestation, diagnostic assessments, surgical intervention, and post-operative care. The neonate presented symptoms such as vomiting, neonatal pneumonia, and gastric outlet obstruction, with a history of low birth weight, BBLR, and polydactyly. Managing Atresia Duodenum is challenging, highlighting the essential role of a multidisciplinary approach for optimal outcomes. Born at 36 weeks gestation via caesarean section due to polyhydramnios, the neonate showed distinct clinical features and relevant laboratory abnormalities. Radiographic confirmation revealed stomach dilation with minimal air in the distal intestine. The Atresia Duodenum bypass procedure on October 10, 2023, focused on intraoperative vital signs and anesthesia management. Post-operatively, the neonate had spontaneous breathing and stable vital signs but showed weakness upon NICU transfer. This analysis underscores the intricate nature of Atresia Duodenum, emphasizing the complexities in diagnosis, surgery, and post-operative care. The case highlights the pivotal role of radiographic modality and the significance of timely intervention. It emphasizes a collaborative approach among neonatologists, surgeons, and anesthesiologists, contributing to the medical literature on Atresia Duodenum.

Keywords: Neonate, Atresia Duodenum, Gastric Outlet Obstruction, Bypass Procedure, Post-Operative Management

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INTRODUCTION

Atresia duodeni, characterized by a partial or complete obstruction of the duodenal lumen, presents a significant risk to neonatal well-being. The disruption of physiological processes inherent in this congenital anomaly underscores the necessity for prompt and precise diagnostic measures to alleviate the potential for life-threatening complications. duodeni atresia is seen in an average of every 5000–10000 live births which is more frequent in baby girls rather than baby boys. Atresia usually occurs at the second part of the duodenum. In more than 50% of the cases associated congenital anomalies are seen.(Sioulas et al., 2017; Srisajjakul et al., 2016)

Atresia duodeni emerges as a distinctive concern requiring dedicated attention and a proactive diagnostic approach. This academic case report aims to expound upon the critical importance of timely diagnostic interventions in identifying atresia duodeni within the neonatal population. By underscoring the significance of prompt diagnosis in the context of atresia duodeni, this report seeks to highlight the potential positive impact of early intervention on neonatal outcomes. The objective of this exploration is not only to deepen our understanding of the diagnostic challenges posed by atresia duodeni but also to initiate a broader discourse on the refinement of diagnostic strategies in neonatal care. Through these efforts, we aspire to facilitate enhanced clinical decision-making and improve outcomes for neonates confronting the intricate landscape of atresia duodeni.(Dolk et al., 2015; Morris et al., 2018) This case report provide comprehensive insights into the diagnostic process, surgical management, and post-operative care of a neonate diagnosed with Atresia Duodenum and associated complications.

CASE REPORT

A 1-day-old male neonate was referred twith a diagnosis of Atresia Duodenum, presenting with low birth weight (1700 grams), a length of 45 cm, and an APGAR score of 6-7-8. Notable symptoms included vomiting, neonatal pneumonia, and stomach dilatation with minimal air in the distal intestine. The neonate also had a history of BBLR and polidaktili on the right hand. Laboratory results revealed abnormalities in APTT (39,1s), calcium (1,23mmol/L), creatinine (0,5mg/dL), hemoglobin (22g/dL), ureum (13,3/µL), Natrium (131/µL) Radiographic examination on October 9, 2023, indicated neonatal pneumonia and dilatation of the stomach with minimal air in the distal intestine, suggesting gastric outlet obstruction (Figure 1).

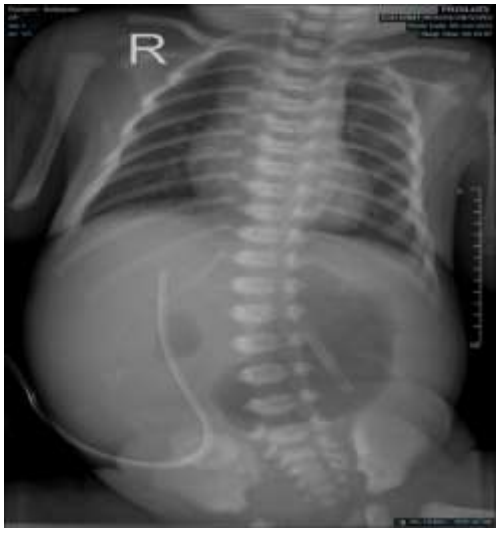

Figure 1. Gastric outlet obstruction

The patient, born at 36 weeks gestation via caesarean section due to polyhydramnion, presented with weakness, a heart rate of 120 bpm, respiratory rate of 40 bpm, temperature of 36.8°C, and weight 1700 2020 grams. Physical examination revealed anemic conjunctiva, non-palpable lymph nodes, symmetric chest movement, and a regular heart rhythm. Pre-operatively, the neonate was assessed as ASA 3 status. The patient underwent a bypass procedure for Atresia Duodenum on October 10, 2023. In the operating room, the neonate exhibited weakness, a heart rate of 127 bpm, respiratory rate of 44 bpm, oxygen saturation of 98%, and a temperature of 36.5°C.

While the patient was positioned in a supine manner in the operating room, preoxygenation and the administration of 0.25 mg of atropine sulfate were simultaneously performed. This was coupled with the placement of monitors for oxygen saturation, EKG, and a stethoscope on the left precordium, along with the smooth insertion of an intravenous line. Intubation was executed using the "sleep without apnea" technique. A 5-microgram dose of Fentanyl was administered, and the sevoflurane was introduced. The laryngoscope was carefully inserted into the mouth, and suction was utilized if any mucus was present. As the identification of the larynx and vocal cords became visible, an uncuffed No. 2.5 endotracheal tube was inserted to a depth of 7 cm using a stylet inside the

endotracheal tube to facilitate proper placement. The ETT was then inserted as deeply as possible, gradually withdrawn until uniform bilateral ventilation sounds were heard. Subsequently, oxygen ventilation was provided using a Jackson-Rees circuit, and a second lung field examination was conducted to assess respiratory sounds in both lung fields. After ensuring the adequacy of all monitors, the endotracheal tube's position was securely fixed.

Maintenance during the surgery was maintained with the following: 5 micrograms of Fentanyl, oxygen administered at a 1:1 air-bar mix with a flow rate of 60%, 2% sevoflurane, and 40 mg of metamizole. Following intubation, intermittent doses of atracurium (0.25 mg) were administered. The infant remained in a supine position. Throughout the 2-hour operation, vital signs were closely monitored, revealing a heart rate of 120-140 bpm, respiratory rate of 40-50 bpm, and oxygen saturation of 98-100%. Intravenous fluids comprised D5½, and post-operative vital signs remained stable. Post-operatively, the neonate exhibited spontaneous breathing, stable vital signs, and was transferred to the Neonatal Intensive Care Unit (NICU) at 17:30 WIB. In the NICU, the neonate displayed weakness, with post-operative vital signs including a respiratory rate of 40 bpm, heart rate of 110 bpm, oxygen saturation of 98%, and a temperature of 36.6°C.

DISCUSSION

The small intestine serves as the primary site for digestion and nutrient absorption. Once the luminal content traverses through the small intestine, no further digestion occurs, and minimal nutrient absorption takes place, although the large intestine absorbs a small amount of salts and water. The small intestine can be divided into three segments: the duodenum, jejunum, and ileum. When any of these segments fail to develop properly in a fetus, it results in intestinal obstruction, a condition known as intestinal atresia.(Dolk et al., 2015; Koberlein & DiSantis, 2016) Intestinal atresia is a common obstructive condition observed in neonates shortly after birth. It can manifest at various locations within the small intestine, with approximately 50% of cases occurring in the duodenum, affecting 57% of females and 43% of males. Around 46% of cases involve the jejunum or ileum, with a higher incidence among males at 61% and females at 39%.(Bishop et al., 2020; Pariente et al., 2012)

Atresia of the duodenum presents as a congenital intestinal obstruction that often leads to bilious or non-bilious vomiting within the first 24 to 38 hours of neonatal life. It is closely associated with a history of polyhydramnios during pregnancy, which is one of the most common prenatal causes of intestinal obstruction. Abdominal radiography typically reveals gastric and duodenal dilatation with a characteristic double-bubble sign. The incidence of duodenal atresia ranges from 1 in 5,000 to 10,000 births, frequently occurring in conjunction with trisomy 21 (Down syndrome) and cardiac abnormalities.(Demirci et al., 2022; Hung et al., 2007) Approximately 30% to 40% of children with duodenal atresia are affected by Down syndrome. Embryologically, duodenal development commences in the fourth week of gestation from the distal foregut and proximal midgut. During the fifth and sixth weeks of intrauterine life, the duodenal lumen temporarily disappears due to intense epithelial cell proliferation. Recanalization of the duodenal lumen occurs during the eleventh week of gestation, marked by vacuolization or degeneration of epithelial cells. Failure in this developmental sequence results in duodenal atresia. Congenital duodenal obstruction can be attributed to both intrinsic and extrinsic factors. Internal etiologies encompass intestinal atresia, stenosis, duodenal tissue bands, and intraluminal duodenal diverticula. External duodenal obstruction can result from annular pancreas, malrotation, or preduodenal portal vein.(Dipak et al., 2019; Miyake et al., 2008)

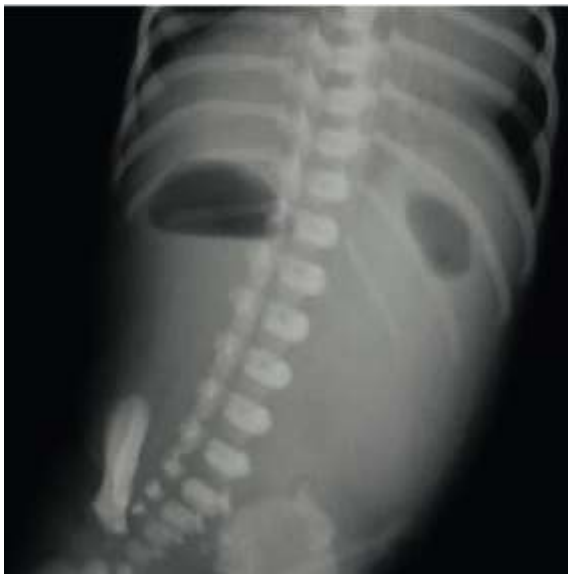

Figure 2. Postnatal X-ray displaying the "double bubble sign.

Congenital duodenal obstruction, as described by Gray S. and Skandalakis J., is categorized into three types. Type I obstruction arises from an intraluminal membrane obstruction composed of mucosal and submucosal layers forming an intraluminal diaphragm. Type II features proximal segment dilation connected to the distal segment by a fibrous cord. Type III involves complete separation between the dilated proximal duodenum and the collapsed distal duodenum. Diagnosis of duodenal obstruction can be established during the prenatal period, with the development of duodenal obstruction occurring at 12-14 weeks of gestation. Ultrasonography (USG) is employed to evaluate the presence of the "double bubble sign," characterized by two fluid-filled structures resembling the stomach and duodenum. Postnatally, X-ray examination reveals the "double bubble sign." In patients with type II and type III duodenal atresia, a diamond-shaped Kimura anastomosis is performed laparoscopically. The laparoscopic diamond-shaped anastomosis technique closely mirrors the open procedure. Transverse duodenotomy is conducted on the dilated proximal duodenal segment and the collapsed distal duodenal segment, with a longitudinal incision made using a needle or hook-shaped electrode.(Castro et al., 2022; Fragoso & Estevão-Costa, 2021; Sakamoto et al., 2019)

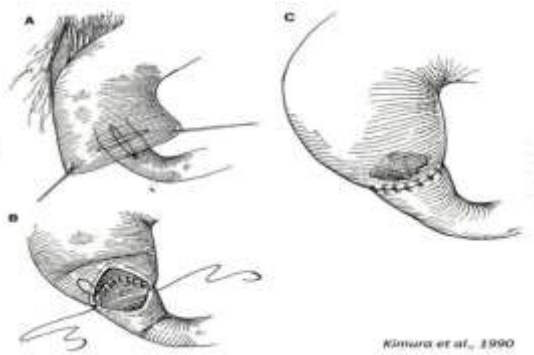

Figure 3: Diamond-shaped Anastomosis

The presented case of a neonate with Atresia Duodenum intricately illustrates the multifaceted nature of this congenital anomaly, emphasizing the importance of a comprehensive diagnostic and therapeutic approach. The clinical presentation, marked by low birth weight, neonatal pneumonia, and gastric outlet obstruction, mirrors the complexity often associated with Atresia Duodenum in neonates. Laboratory abnormalities, including prolonged APTT, altered calcium levels, and elevated hemoglobin, further underscore the systemic impact of this condition. The radiographic evidence of dilatation of the stomach with minimal air in the distal intestine provides valuable diagnostic insight, aligning with the known characteristics of gastric outlet obstruction. The neonate's pre-operative status, classified as ASA 3, highlights the severity of the condition and emphasizes the need for meticulous perioperative care.(Latzman et al., 2014; Tashjian & Moriarty, 2001)

The surgical intervention, a bypass procedure for Atresia Duodenum, reflects the integral role of timely and targeted surgical management in mitigating the potential life-threatening consequences of this anomaly. Intraoperative monitoring, including anesthesia management and vital sign surveillance, ensured the neonate's stability during the procedure. Post-operatively, the transfer to the NICU and the subsequent observation of the neonate's vital signs reveal the ongoing challenges in the early postoperative period. The weakness observed post-operatively underscores the systemic impact of the congenital anomaly, necessitating continued multidisciplinary care.(Brown et al., 2009; Carroll et al., 2016; Komuro et al., 2011)

This case report contributes to the existing literature by providing a detailed account of the clinical, diagnostic, and therapeutic dimensions associated with Atresia Duodenum in neonates. The complexities outlined in this case underscore the importance of a holistic and collaborative approach involving neonatologists, surgeons, and anesthesiologists. Further research and collective experiences in managing similar cases will undoubtedly enhance our understanding and refine strategies for the optimal care of neonates with Atresia Duodenum.

CONCLUSION

This case report provides valuable insights into the diagnosis, surgical management, and post-operative care of a neonate with Atresia Duodenum and gastric outlet obstruction. It emphasizes the need for comprehensive pre-operative assessment, meticulous surgical technique, and vigilant post-operative monitoring to ensure optimal outcomes for these patients.

REFERENCE

Bishop, J. C., McCormick, B., Johnson, C. T., Miller, J., Jelin, E., Blakemore, K., & Jelin, A. C. (2020). The Double Bubble Sign: Duodenal Atresia and Associated Genetic Etiologies. *Fetal Diagnosis and Therapy*, *47*(2), 98–103. https://doi.org/10.1159/000500471

Brown, C., Numanoglu, A., Rode, H., & Sidler, D. (2009). Situs inversus abdominalis and duodenal atresia: a case report and review of the literature. *South African Journal of Surgery. Suid-Afrikaanse Tydskrif Vir Chirurgie*, *47*(4), 127–130. http://www.ncbi.nlm.nih.gov/pubmed/20141070

Carroll, A. G., Kavanagh, R. G., Ni Leidhin, C., Cullinan, N. M., Lavelle, L. P., & Malone, D. E. (2016). Comparative Effectiveness of Imaging Modalities for the Diagnosis of Intestinal Obstruction in Neonates and Infants: *Academic Radiology*, *23*(5), 559–568. https://doi.org/10.1016/j.acra.2015.12.014

Castro, P. T., Fazecas, T., Matos, A. P. P., Ribeiro, G., Araujo Júnior, E., & Werner, H. (2022). Concomitant fetal duodenal and esophageal atresia: three-dimensional reconstruction from magnetic resonance imaging. *Ultrasound in Obstetrics & Gynecology*, *59*(2), 277–278. https://doi.org/10.1002/uog.24837

Demirci, O., Eriç Özdemir, M., Kumru, P., & Celayir, A. (2022). Clinical significance of prenatal double bubble sign on perinatal outcome and literature review. *The Journal of Maternal-Fetal & Neonatal Medicine*, *35*(10), 1841–1847. https://doi.org/10.1080/14767058.2021.1874338

Dipak, N. K., Reddy, S., Jaiswal, K. K., & Kumar, A. (2019). Neonate with mirror image of double bubble sign. *Archives of Disease in Childhood - Education & Practice Edition*, *104*(2), 101–102. https://doi.org/10.1136/archdischild-2018-314803

Dolk, H., Loane, M., Teljeur, C., Densem, J., Greenlees, R., McCullough, N., Morris, J., Nelen, V., Bianchi, F., & Kelly, A. (2015). Detection and investigation of temporal clusters of congenital anomaly in Europe: seven years of experience of the EUROCAT surveillance system. *European Journal of Epidemiology*, *30*(11), 1153–1164. https://doi.org/10.1007/s10654-015-0012-y

Fragoso, A. C., & Estevão-Costa, J. (2021). Quadruple bubble—a sign of three concomitant malformations. *Prenatal Diagnosis*, *41*(1), 5–5. https://doi.org/10.1002/pd.5733

Hung, J., Shen, S., Chin, T., & Hung, C. S. (2007). Prenatal diagnosis of double duodenal atresia by ultrasound and magnetic resonance image. *Prenatal Diagnosis*, *27*(4), 381–383. https://doi.org/10.1002/pd.1658

Koberlein, G., & DiSantis, D. (2016). The "double bubble" sign. *Abdominal Radiology*, *41*(2), 334–335. https://doi.org/10.1007/s00261-015-0558-x

Komuro, H., Ono, K., Hoshino, N., Urita, Y., Gotoh, C., Fujishiro, J., Shinkai, T., & Ikebukuro, K. (2011). Bile duct duplication as a cause of distal bowel gas in neonatal duodenal obstruction. *Journal of Pediatric Surgery*, *46*(12), 2301–2304. https://doi.org/10.1016/j.jpedsurg.2011.09.018

Latzman, J. M., Levin, T. L., & Nafday, S. M. (2014). Duodenal atresia: not always a double bubble. *Pediatric Radiology*, *44*(8), 1031–1034. https://doi.org/10.1007/s00247-014-2896-1

Miyake, H., Yamamoto, A., Yamada, T., Okazaki, K., Morita, K., Kondo, M., Ishida, T., Nishina, T., Yokota, A., Nakai, A., & Takeshita, T. (2008). Umbilical Cord Ulceration after Prenatal Diagnosis of Duodenal Atresia with Interstitial Deletion of Chromosome 13q: A Case Report. *Fetal Diagnosis and Therapy*, *24*(2), 115–118. https://doi.org/10.1159/000142140

Morris, J. K., Springett, A. L., Greenlees, R., Loane, M., Addor, M.-C., Arriola, L., Barisic, I., Bergman, J. E. H., Csaky-Szunyogh, M., Dias, C., Draper, E. S., Garne, E., Gatt, M., Khoshnood, B., Klungsoyr, K., Lynch, C., McDonnell, R., Nelen, V., Neville, A. J., … Dolk, H. (2018). Trends in congenital anomalies in Europe from 1980 to 2012. *PLOS ONE*, *13*(4), e0194986. https://doi.org/10.1371/journal.pone.0194986

Pariente, G., Landau, D., Aviram, M., & Hershkovitz, R. (2012). Prenatal Diagnosis of a Rare Sonographic Appearance of Duodenal Atresia. *Journal of Ultrasound in Medicine*, *31*(11), 1829–1833.

https://doi.org/10.7863/jum.2012.31.11.1829

Sakamoto, N., Mitsuzuka, K., Kanno, Y., Hayashi, M., Goto, Y., Ueno, S., & Ishimoto, H. (2019). Atypical Presentation of Duodenal Atresia Concomitant with Type-A Esophageal Atresia in Fetal Life: A Case Report. *The Tokai Journal of Experimental and Clinical Medicine*, *44*(2), 31–33. http://www.ncbi.nlm.nih.gov/pubmed/31250423

Sioulas, A. D., Grammata, P., & Scotiniotis, I. (2017). An Obstructive Wind Sock Web Deformity of the Proximal Duodenum. *The Indian Journal of Surgery*, *79*(3), 270–271. https://doi.org/10.1007/s12262-017-1641-z

Srisajjakul, S., Prapaisilp, P., & Bangchokdee, S. (2016). Imaging spectrum of nonneoplastic duodenal diseases. *Clinical Imaging*, *40*(6), 1173–1181. https://doi.org/10.1016/j.clinimag.2016.08.007

Tashjian, D. B., & Moriarty, K. P. (2001). Duodenal atresia with an anomalous common bile duct masquerading as a midgut volvulus. *Journal of Pediatric Surgery*, *36*(6), 956–957. https://doi.org/10.1053/jpsu.2001.24003