Case study

Axial torsion of a Giant Meckel's Diverticulum Causing small bowel obstruction: A case report and Review of the literature

Abstract

A Meckel's Diverticulum length more than 5 cm are classified as giant Meckel's Diverticulum. Giant Meckel's Diverticulum are relatively rare and may be more prone to complications, especially for small bowel obstruction. Axial torsion followed by gangrene of Meckel's Diverticulum is the rarest of the complication that have been reported. Preoperative diagnosis of torsion of Meckel's Diverticulum is very difficult. Risk of torsion increases with longer and larger Meckel's Diverticulum with its narrow base.

We report a case of 25 years-old male, who presented an axial torsion and gangrene of a giant Meckel's Diverticulum causing small bowel obstruction, in whom intraoperative findings of axial torsion and gangrene of Meckel's Diverticulum, causing small bowel obstruction was found after emergency explorative laparotomy. Small bowel segment of 10 cm along with gangrenous Meckel's Diverticulum resected and end to end anastomosis of ileum was done. Here we discuss one such rare case of axial torsion of giant Meckel's Diverticulum associated with intestinal obstruction in an adult.

Keywords

Giant Meckel's Diverticulum, Axial torsion, gangrene, small bowel obstruction, Emergency surgery.

Introduction

Meckel's Diverticulum is a congenital abnormality of gastrointestinal track arising due to the persistence of the vitelline duct. Meckel's Diverticulum follows the well-established "rule of two", it is found in 2 % population, usually found before 2 years of age, 2 inches long and located two feet proximal to the ileocecal valve, two times more common in males.[2,3,4,5,9]

Meckel's Diverticulum is true diverticulum which was first described by Johann Fedrich Meckel in 1809 [2, 5, 9]. Giant Meckel's Diverticulum are more liable for small bowel obstruction and diverticulitis in adults. The complications of Meckel's Diverticulum includes hemorrhage, obstruction, torsion, perforations and diverticulitis. Among these, torsion is one of the rare reported complication of Meckel's Diverticulum [2, 3, 4, 5,9].

We present a very unusual case of giant Meckel's Diverticulum and small bowel obstruction caused by axial torsion of Meckel's Diverticulum. Axial torsion of Meckel's Diverticulum is the rarest complication.

Case Report

A 25 years-old male patient with complaints of severe abdominal pain, distension of abdomen and constipation of 3 days. Physical examination, patient was hemodynamically stable. Patient was admitted at Jatal hospital and research Centre in the year 2002. Plain

X-ray abdomen showing acute small bowel obstruction with multiple fluid levels. On ultrasonography and CT abdomen confirmed the diagnosis of acute intestinal obstruction.

Therefore an emergency explorative laparotomy was performed, using a vertical midline incision and revealed 500 ml serosanguineous fluid in the peritoneal cavity with distended small bowel loops, there was a gangrenous giant Meckel's Diverticulum. Intraoperatively a twisted narrow base of giant Meckel's Diverticulum of size 12x4 cm with gangrene. **(Figure No. A-B).** Giant Meckel's Diverticulum was axially rotated by 520^{0}, which caused small bowel obstruction. The twisted & gangrenous Meckel's Diverticulum was resected along with 5 cm of ileum proximal & distal to its base and end to end anastomosis using 2.0 vicryl suture was made to reestablished the continuity of small intestine **(Figure No. C-D).** A through peritoneal wash was done followed by the insertion of pelvic drain. Post-operative recovery was uncomplicated and patient was discharged on the 8^{th} post-operative day.

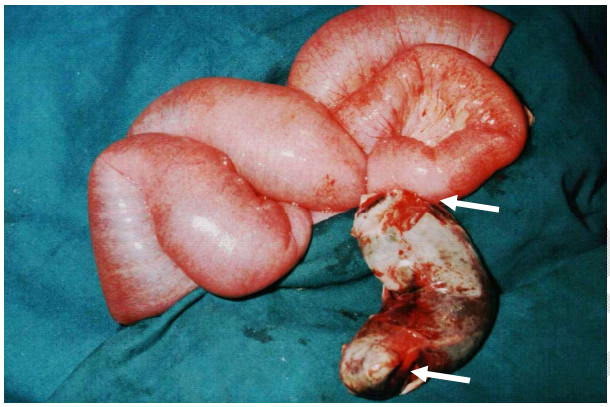

Figure A- Intraoperative view –Axial torsion of Giant MD and Gangrene. Size 12x 3 cm

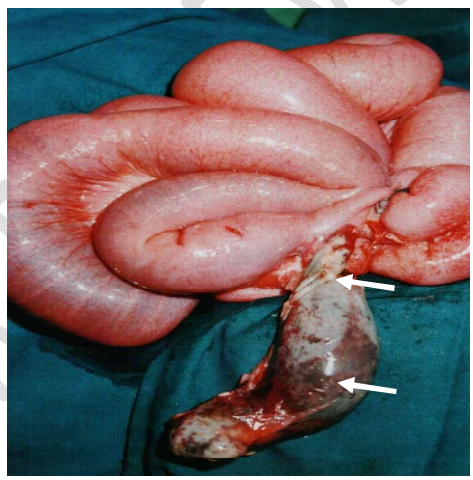

Figure B- Untwisting of Giant MD and gangrene

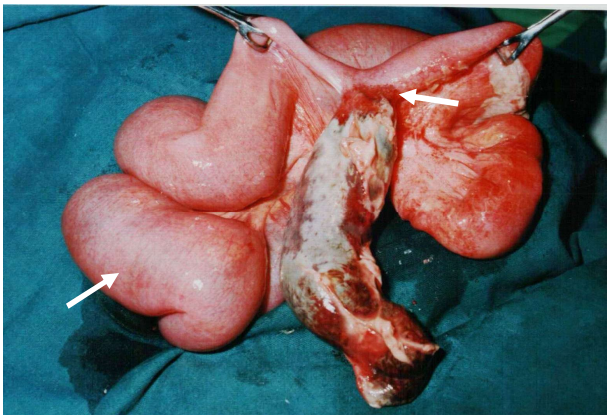

Figure C- Intraoperative view –Axial torsion and gangrene of MD Causing small bowel obstruction

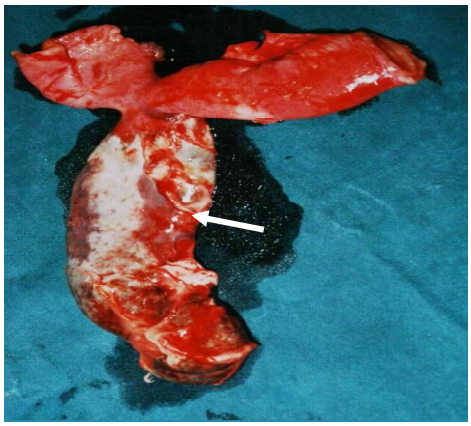

Figure D- ileal segment resection with gangrenous MD

Meckel's Diverticulum is a remnant of the vitelline duct and is a true diverticulum, containing three layers of intestine. The vitelline duct regress during 6^{th} to 10^{th} week of fetal, development but occasionally may persist a blind loop of Meckel's Diverticulum located at the antimesenteric border of the distal ileum [1, 2, 3, 4, 5, 9].

Patient with Meckel's Diverticulum are widely symptomatic but in 4-6% of the cases, a possible complication leads to its detection. Hemorrhage predominantly occurs in pediatric age group within in 2 years of life due to presence of ectopic gastric tissue 50% and pancreatic tissue in 5 % of cases. Obstructive symptoms with intussusception arises commonly due to inverted Meckel's Diverticulum, incarcerated hernia, enterolith, torsion and volvulus mostly in adult cases [2,3,5,9,10].

Torsion is one of the rarest complication of Meckel's Diverticulum and only a few reports exist in adults. Meckel's Diverticulum is sometimes attached to the ileal mesentery or umbilicus and the presence of mesodiverticular bands makes it susceptible to torsion [7, 9, 10]. Another contributing factor associated with torsion is the length, breadth and base diameter of the diverticulum. Meckel's Diverticulum having a narrow base with length more than 5 cm and giant Meckel's Diverticulum are, more prone to axial torsion and gangrene of Meckel's Diverticulum. The Meckel's Diverticulum in our case measured 12 cm long with narrow base which underwent axial torsion and gangrene due to compromising the blood supply and eventually becoming gangrene [2, 4, 5, 3].

Preoperative diagnosis of Meckel's Diverticulum is a challenge to general surgeon pediatric surgeon and the gastrointestinal surgeons. Now a days several imaging modalities are used which include x-ray, ultrasonography, CT and MRI, but have proved to be of little diagnostic value [2, 3, 4, 5, 9, 10]. Explorative procedures provide a better picture, prompt diagnosis and surgical resection.

The Review of literature

In the English literature discussed 6 cases in children and less than 20 cases in adults. PubMed & Google scholar search found three similar case reports of axial torsion and gangrene of Meckel's Diverticulum causing small bowel obstruction. A review of literature identified total seven reported cases. Gangrene of Meckel's Diverticulum secondary to axial torsion has been reported only eleven times in adults [2, 5, 9]. Only two cases of coexistence have been reported in the English literature. [2]

The systematic review by healy et al –March 2020. A literature review of 40 years found 10 pediatric cases and 16 adults' cases of Meckel's Diverticulum with axial torsion. In the pediatric population most reported cases were in the adolescent period. Narrow base, excessive length attached to the umbilicus or to the ileal mesentery are the predisposing factors to axial torsion.

Discussion

In our study of 40 years surgical practice at Jatal hospital & Research Centre, Latur. We found 10 cases of giant Meckel's Diverticulum, 3 cases were adolescent and 7 cases were adults. One case was presented axial torsion & gangrene of Meckel's Diverticulum causing small bowel obstruction. Two cases were presented as Meckel's Diverticulum volvulus and small bowel obstruction. One case of strangulation of small bowel due to mesodiverticular band and six cases were presented with Meckel's Diverticulitis.

Conclusion

Axial torsion of giant Meckel's Diverticulum is a rare cause of small bowel obstruction and requires emergency surgery. Usually, it requires a high index of suspicion

and surgical management. Laparoscopic resection is the viable option and should be pursued if the expertise is available.

References

1. Parab SV, Salve PG, Dahiphale A, Thakare R, Aiwale A. Axial Torsion of Meckel's Diverticulum: A Rare Case Report. J Clin Diagn Res. 2017 Sep;11(9):PD05-PD06. doi: 10.7860/JCDR/2017/28613.10580. Epub 2017 Sep 1. PMID: 29207775; PMCID: PMC5713797.

2. Murruste M, Rajaste G, Kase K. Torsion of Meckel's diverticulum as a cause of small bowel obstruction: A case report. World J Gastrointest Surg. 2014 Oct 27;6(10):204-7. doi: 10.4240/wjgs.v6.i10.204. PMID: 25346803; PMCID: PMC4208045.

3. Onyemkpa C, Kuhns B, Murickan T, Drayer C, Obinwanne K. Axial torsion of a giant Meckel's diverticulum. Int J Case Rep Images 2021;12:101192Z01CO2021

4. Seth A, Seth J. Axial torsion as a rare and unusual complication of a Meckel's diverticulum: a case report and review of the literature. J Med Case Rep. 2011 Mar 28;5:118. doi: 10.1186/1752-1947-5-118. PMID: 21443776; PMCID: PMC3073917.

5. Ajmal H, Majid Z, Tahir F, et al. (January 19, 2020) Axial Torsion and Gangrene: An Unusual Complication of Meckel's Diverticulum. Cureus 12(1): e6702. doi:10.7759/cureus.6702

6. Hadeed AA, Azar RR, Azar NN, Benninger B. Meckel's diverticulum complicated by axial torsion and gangrene. J Surg Case Rep. 2015 Mar 1;2015(3):rjv008. doi: 10.1093/jscr/rjv008. PMID: 25733669; PMCID: PMC434528

7. N Thulasivasudevaiah1 , S Sudhir2 , Deepak Naik3 , DK Dilip4 , Aparna Mallya Strangulated Small Intestinal Obstruction due to Giant Meckle's Diverticulum: A Case Report DOI: 10.7860/JCDR/2019/41406.13176

8. Liviu Musteata, Raouf Fayisall Geraldo, Hugues Ndasu Matendo, Aurélie Reitz, Valériu Krasovski, Valentin Nitu, Thierry Gastaud, Fabrice Cattan, "Meckel Diverticulum Causing Intestinal Volvulus", *Case Reports in Surgery*, vol. 2020, Article ID 8872668, 3 pages, 2020. https://doi.org/10.1155/2020/8872668

9. Luu AM, Meurer K, Herzog T, Uhl W, Tannapfel A, Braumann C. Small Bowel Obstruction due to a Giant Meckel's Diverticulum. Visc Med. 2016 Dec;32(6):434-436. doi: 10.1159/000450589. Epub 2016 Nov 22. PMID: 28229080; PMCID: PMC5290431.

10. Lequet J, Menahem B, Alves A, Fohlen A, Mulliri A: Meckel's diverticulum in the adult. J Visc Surg. 2017, 154:253-259. 10.1016/j.jviscsurg.2017.06.006

11. Andrew A.H. Hadeed, Robert R.A. Azar, Nabiel N.A. Azar, Brion Benninger, Meckel's diverticulum complicated by axial torsion and gangrene, *Journal of Surgical Case Reports*, Volume 2015, Issue 3, March 2015, rjv008, https://doi.org/10.1093/jscr/rjv008

12. Parab SV, Salve PG, Dahiphale A, Thakare R, Aiwale A: Axial torsion of Meckel's diverticulum: a rare case report. J Clin Diagn Res. 2017, 11:PD05-PD06. 10.7860/JCDR/2017/28613.10580