Turk J Gastroenterol 1997; 8:206-209

# Meckel's diverticulum as a cause of small bowel obstruction in children and young adults

## Çocuk ve genç erişkinlerde ince barsak tıkanma nedeni olarak Meckel divertikülü

Emin GÜRLEYİK MD, Günay GÜRLEYİK MD, Selçuk ÜNALMIŞER MD

*Haydarpaşa Numune Hastanesi 4. Genel Cerrahi Kliniği, İstanbul*

**ÖZET:** *Gastrointestinal kanalın en sık görülen konjenital anomalisi olan Meckel divertikülü yaşam boyunca nadiren semptomatik olmaktadır. Semptomatik divertikülün en önemli komplikasyonlarından biri intestinal obstrüksiyondur. Bunun yanında laparotomi esnasında tesadüfen bulunan asemptomatik divertikülün eksizyonu bir başka tartışılan noktadır. Son 10 yıllık sürede cerrahi olarak tedavi edilmiş ince barsak obstrüksiyonlu 243 olgunun dosya ve amaliyat kayıtları retrospektif olarak incelendi. İnce barsak obstrüksiyonuna neden olan Meckel divertiküllü 20 olgu saptandı. İnce barsak obstrüksiyonlarının %8.2'sinde neden olarak Meckel divertikülü bulundu. Olguların 18'i(%90) 40 yaş altındaydı ve 17'si(%85) erkekti. 40 yaş altındaki obstrüksiyon olgularında divertikül oranı %15 idi ve bu oran 40 yaş üzerinde %1.6'ya düştü (p=0.0003). 13 olgu(%65) 20 yaş altındaydı (p=0.00013). Bu yaş grubundaki ince barsak obstrüksiyonlarının %20.3'ünde neden Meckel divertikülü idi. 13 olguda ucundan göbeğe fibröz bir bant ile bağlı divertikül ince barsak volvulus nedeni olarak bulundu. İnvajinasyon saptanan 4 olguda öncü nakta Meckel divertikülü idi. 3 olguda mezo-divertiküler bant altında ince barsak segmentlerinin internal herniasyonu bulundu. 5 olguda (%25) strangülasyon ve ince barsak nekrozu saptandı. Cerrahi tedavi tüm olgularda başarılı oldu. Sonuç olarak Meckel divertikülü, çocuk ve genç erişkinlerde yüksek ince barsak obstrüksiyon riski taşımaktadır. Divertikülü ucundan göbeğe bağlayan fibröz bant ve mezodivertiküler bant varlığı obstrüktif komplikasyon riskini anlamlı olarak artırmaktadır. Bu bulgular, çocuk ve genç erişkinlerde laparotomi esnasında tesadüfen bulunan ve/veya fibröz bant ile fikse olan Meckel divertikülünün, muhtemel intestinal obstrüksiyon riski nedeniyle çıkarılması gerektiğini desteklemektedir.*

Anahtar Kelimeler: **Meckel divertikülü, intestinal obstrüksiyon, volvulus, invajinasyon**

**SUMMARY:** *The most common congenital abnormality of the gastrointestinal tract, Meckel's diverticulum rarely becomes symptomatic during the entire life. Intestinal obstruction is one of the major complications of the diverticulum. Excision of Meckel's diverticulum encountered incidentally at laparotomy is another point of discussion. We reviewed retrospectively the charts and operative records of 243 surgically treated patients with small bowel obstruction, and determined 20 cases of intestinal obstruction related to Meckel's diverticulum. In our study Meckel's diverticulum was found as a causative factor in 8.2% of small bowel obstruction. The prevalence of Meckel's diverticulum related obstructions was 20.3 percent in patients younger than 20 years and 15% younger than 40 years, and it dropped to 1.6% over 40 years of age (p=0.0003). Seventeen patients (85%) were male. Thirteen patients (65%) with obstructive complications of the diverticulum were at 20 years of age or younger (p=0.00013). The diverticulum connected to the umbilicus by a fibrous band was the cause of small bowel volvulus in 13 patients. It was a lead-point in 4 cases of intussusception. Internal herniation of small bowel segment under a mesodiverticular band was determined in 3 patients. Strangulation and bowel necrosis occured in 5 patients (25%). Surgical treatment was successful in all patients. In conclusion Meckel's diverticulum carries a considerable risk of small bowel obstruction in children and young patients. The existence of a mesodiverticular band or a fibrous band which connects the tip of the diverticulum to the umbilicus increases its obstructive complications significantly. These findings justify excision of incidentally found Meckel's diverticulum in patients at 40 years of age or younger, and especially of the diverticulum attached by congenital fibrous bands.*

Key Words: **Meckel's diverticulum, intestinal obstruction, volvulus, intussusception**

IN 1808 Johann Friedrich Meckel fully described the most common gastrointestinal congenital abnormality known as Meckel's diverticulum. The majority of Meckel's diverticula remain asymptomatic throughout life, and in most cases they were found at postmortem examination in autopsy series and incidentally at laparotomy. In hospital practice, a small number of Meckel's diverticulum

Geliş tarihi: 20.11.1996 Kabul tarihi: 6.4.1997
**Türk Gastroenteroloji Dergisi, 1997**

**Table 1.** Sites, forms, and complications of intestinal obstruction secondary to Meckel's diverticulum, and demographic features of patients

| *Sites and forms* | *Patients* | *Mean age* | *Sex* | | *Bowel Necrosis* |
|---|---|---|---|---|---|
| | | | *Male* | *Female* | |
| -Small bowel volvulus around omphalo-mesenteric band | 13 (65)* | 17 | 11 | 2 | 4 |
| -Intussusception leading by the diverticulum | 4 (20) | 19 | 3 | 1 | 1 |
| -Small bowel trapped under a mesodiverticular band | 3 (15) | 11 | 3 | – | – |
| -Total | 20 | 17 | 17 (85) | 3 (15) | 5 (25) |

*Number in parantheses are percentages

is presented with complications. These complications depend on the pathologic features of the diverticulum: Rectal bleeding from peptic ulceration of adjacent ileal mucosa secondary to heterotopic gastric mucosa in the diverticulum; inflammation of the diverticulum simulating clinical features of acute appendicitis; and various forms of intestinal obstruction caused by the diverticulum (1-3). In this paper we aimed to present our experience of obstructive complication of Meckel's diverticulum in our surgical emergency practice.

## PATIENTS AND METHODS

In the of last ten years, the records of emergency operations were reviewed in order to determine patients who were operated for the treatment of mechanical bowel obstruction. In this period we determined 388 surgically treated cases of intestinal obstructions excluding incarcerated external abdominal hernias. There were 243 cases (62.6%) of small bowel obstructions. We observed 20 patients with obstructive complication of Meckel's diverticulum. The charts and operative records of these patients were carefully examined with respect to prevalence, patients demographic features, sites and forms of bowel obstruction, complications, pathologic features of complicated diverticula, surgical treatment, and outcome of patients. Statistical analysis was made using the chi square test, and p values less than 0.05 were taken as significant.

## RESULTS

Meckel's diverticulum had a prevalence of 8.2% in small bowel obstruction. Seventeen patients were male with a mean age of 17 years (ranging from 7 months to 49 years). In all 20 patients the final diagnosis of intestinal obstruction secondary to Meckel's diverticulum was established at laparotomy. We encountered three forms of small bowel obstruction caused by the diverticulum: Small bowel volvulus, intussusception, and internal hernia under a mesodiverticular band. Meckel's diverticulum connected to the umbilicus by a fibrous band was the rotation axis of bowel segment in 13 patients who constituted 40.6% of all small bowel volvulus cases. The diverticulum was the leading point in 4 cases of intussusception as it formed 17.4% of such cases. In 3 patients a segment of small bowel had become trapped under a mesodiverticular band between the tip of the diverticulum and the base of the mesentery. The obstructed bowel segment was gangrenous in 5 patients (25%; Table 1).

Thirteen patients (65%) with obstruction related to Meckel's diverticulum were at 20 years of age or younger (p=0.00013). Eighteen patients (90%) with intestinal obstruction secondary to Meckel's diverticulum constituted 15% of small bowel obstruction in patients under 40 years, and this incidence was 1.6% over 40 years of age (P=0.0003; Table 2).

At emergency laparotomy, the treatment was achieved with the resection of gangrenous segment of the small bowel containing the diverticulum and primary anastomosis of the small bowel in 5 patients with bowel necrosis. In 15 patients simple excision of the diverticulum was performed after reduction of the obstructed segment of the small bowel.

There was neither postoperative mortality and nor major complication. All patients were discharged in ten days postoperatively.

## DISCUSSION

Meckel's diverticulum which is known as a rem-

**Table 2.** Prevalence of small bowel obstruction (SBC) secondary to Meckel's diverticulum according to patients' age

| *Age with SBO* | *Patients to Meckel's diverticulum* | *Obstruction secondary diverticulum in SBO* | *Prevalence of Meckel's* |
|---|---|---|---|
| 0-20 | 64 (26) | 13 (65) | 20.3 % |
| 21-40 | 55 (23) | 5 (25) | 9.1 % |
| 41-60 | 65 (27) | 2 (10) | 3.1 % |
| 61-80 | 52 (21) | – | – |
| +80 | 7 (3) | – | – |
| Total | 243 (100) | 20 (100) | 8.2 % |

* Number in parantheses are pencentages

nant of vitelline duct, arises from antimesenteric border of distal ileum. In a recent study the incidence of Meckel's diverticulum was found to be 1.5% at routine surgical explorations in 2074 patients (4). Previous studies indicated that in most cases Meckel's diverticulum remains asymptomatic during the entire life (2,3). Mackey and Dineen (5) reported that in surgical practice only 10 to 20 percent of Meckel's diverticulum were removed for treatment of its complications. In hospital practice excluding autopsy studies, symptomatic diverticula incidence was determined as 20 to 43 percent in surgically treated patients with excision of Meckel's diverticula (6-9). In general, the great majority of the complications of the diverticulum were classified in 3 categories: hemorrhage; inflammation, and intestinal obstruction (10-12,13). Especially in young adults, intestinal obstruction is the most common complication of Meckel's diverticulum, and it was reported to be 14 to 53% among complications of the diverticulum in Japanese, European, and American series (5,8,14). We studied obstructive complications of Meckel's diverticulum in patients who were operated on for mechanical bowel obstruction. Our findings suggest that the diverticulum has a considerable rate in small bowel obstruction with a prevalence of 8.2%.

In our study volvulus was the most common form of small bowel obstruction related to Meckel's diverticulum. In these cases bowel obstruction occured from congenital bands associated with the diverticulum. Like our cases occasionally the diverticulum which is connected to the umbilicus by a fibrous band that forms the rotation axis of bowel segment, carries a high risk of obstruction. Whereas, Meckel's diverticulum with a fixed tip, may cause bowel obstruction by twisting small bowel segments along its long axis (15,16). Intussusception and internal hernia under a mesodiverticular band were other two forms of bowel obstruction caused by Meckel's diverticulum. Intestinal obstruction occurs from a Meckel's diverticulum which forms the lead-point of intussusception. Also existence of a mesodiverticular band between the tip of the diverticulum and the base of the mesentery as a remnant of vitelline artery, increases the risk of obstruction. Williams (13) reported that in 476 collected cases of intestinal obstruction secondary to the diverticulum, 275 (58%) were due to the congenital bands (omphalomesenteric or mesodiverticular), and 201 (42%) due to the intussusception. Brophy and Saeshore (11) reported that in a pediatric group, 10 of 24 symptomatic diverticulum were presented with obstructive complication, and intestinal obstruction secondary to Meckel's diverticulum were due to intussusception in five and to internal hernia under a mesodiverticular band in five. The diverticulum was found as a lead-point causing to intussusception in our 4 patients with intestinal obstruction secondary to Meckel´s diverticulum. Existence of a lead-point in intussusception is a common finding in adults, and uncommon in children (17,18).

As our findings pointed out male patients with bowel obstruction secondary to Meckel's diverticulum highly outnumbered female patients, most of them were at 20 years of age or younger; it supported the fact that younger age and male sex were demographic risk factors for Meckel's diverticulum related bowel obstruction. As a congenital abnormality, complications of Meckel's diverticulum are common in the first half of life. The complication rate in older patient is negligible. Our findings about obstructive complications of the diverticulum support this suggestion. The prevalence of 15% of Meckel's diverticulum as a causative factor of small bowel obstruction in patients younger than 40 years, declined to 1.6% in patients older than 40 years of age. Previous studies also confirmed that majority of its complications occured in male patients younger than 40 years (5,19).

In our study the final diagnosis of the diverticulum was established at laparotomy. Obstructive and inflammatory complications of Meckel's diverticulum are rarely diagnosed before laparotomy. Since bowel obstruction and acute inflammation are treated with emergency laparotomy, the time is not sufficient for proper evaluation. On the other hand, patients with gastrointestinal hemorrhage usually undergo preoperative examination, and in most cases a bleeding diverticulum may be accurately diagnosed by scintigraphy (14).

Removal of incidentally found Meckel's diverticulum is controversial. Some authors claim that resection of an asymptomatic diverticulum can be performed safely, regardless of the patient's age (4,10,20). On the contrary, others propose to leave an uncomplicated diverticulum alone because in adults occurrence of complications approximates zero with advanced age and the rate of postoperative complications of diverticulectomy is higher than the eventual development of symptoms related to Meckel's diverticulum (7,8,21).

However existence of some risk factors leads to removal of the diverticulum incidentally found at laparotomy. In our study congenital fibrous bands either umblical or meso-diverticular were pathologic features of the diverticulum which caused intestinal obstruction in our 16 patients. According to our findings about obstructive complication of the diverticulum we can propose removal of incidentally found Meckel's diverticulum in children and young adults. Existence of fibrous bands fixing the tip of the diverticulum may also justify resection of such an asymptomatic diverticulum found at laparotomy. Longo et al (22) also proposed resection of diverticula fixed with fibrous bands and including ectopic tissue.

In conclusion, obstructive complications of Meckel's diverticulum are common in male patients, and in children and young adults. Congenital fibrous bands associated with the diverticulum increase the risk of small bowel obstruction. It is found incidentally at laparotomy during routine exploration, removal of an asymptomatic Meckel's diverticulum in children and young adults, and resection of a diverticulum connected by fibrous bands must be taken into account due to higher rate of obstructive complication.

**REFERENCES**

1. Ellis H. Meckel's Diverticulum, Diverticulosis of Small Intestine, Umblical Fistulae and Tumours. In: Schwartz SI, and Ellis. H, eds. Maingot's Abdominal Operations. 9th ed. East Norwalk, Connecticut: Appleton & Lange, 1990:833-46.
2. Eickelberger MR, Anderson KD, Randolph JG, Melter JL. Surgical Conditions of the Small Intestine in Infants and Children. In: Nyhus LM, ed. Shackelford's Surgery of Alimentary Tract. 3rd ed. Volume V. Philadelphia: WB. Saunders Co., 1991:308-29.
3. Eckhauser FE, Raper SE. Diverticular Disease of the Small Bowel. In: Cameron JL, ed. Current Surgical Therapy. 4th ed. St.Louis, MO: B.C. Decker, 1992:123-37.
4. Matsagas MI, Fatouros M, Koulouros B, Giannoukas AD. Incidence, complication, and management of Meckel's diverticulum. Arch Surg 1995;130:143-6.
5. Mackey WC, Dineen PA. Fifty years experience with Meckel's Diverticulum. Surg Gynecol Obstet 1983;156:56-64.
6. Ludtke FE, Mende V, Kohler H, Lepsien G. Incidence and frequency of complications and management of Meckel's diverticulum. Surg Gynecol Obstet 1989;169:537-42.
7. Richard MA, Simpson CJ. Meckel's diverticula in an adult surgical unit, eleven years experience. Scott Med J 1985;30:175-6.
8. Leijonmarck CE, Bonman-Sandelin K, Frisell J, Raf L. Meckel's diverticulum in the adult. Br J Surg 1986;73:146-9.
9. Lang-Stevenson A. Meckel's diverticulum: to look or not to look: to resect or not to resect. Ann R Coll Surg Engl 1983;65:218-20.
10. Garretson DC, Frederich ME. Meckel's diverticulum. Am Fam Physician 1990;42:115-9.
11. Brophy C, Seashore J. Meckel's diverticulum in the pediatric surgical population. Conn Med 1989;53:203-5.
12. Ymaguchi M, Takeuchi S, Awazu S. Meckel's diverticulum, investigation of 600 patients in Japanese literature. Am J Surg 1978;136:247-9.
13. Williams RS. Management of Meckel's diverticulum. Br J Surg 1981;68:477.
14. Kusumato H, Yoshida M, Takahashi I, et al. Complications and diagnosis of Meckel's diverticulum in 776 patients. Am J Surg 1992;164:382-3.
15. Osborne MP, Hamilton G, Shaller M. Axial volvulus of Meckel's diverticulum. Postgrad Med J 1978;54:692-3.
16. D.Souza CR, Kilam S, Prokopishyn H. Axial volvulus of the small bowel caused by Meckel's diverticulum. Surgery 1993;114:984-7.
17. Chung JL, Kong WS, Lin JN, Wang KL, Lou CC, Wong HF. Intussusception in infants and children: risk factors leading to surgical reduction. J Formos Med Assoc 1994;93:481-5.
18. te-Shake L. Intussusception in adults. Diagn Imaging 1980;49:15-22.
19. Brown CK, Olshaker JS. Meckel's diverticulum. Am J Emerg Med 1988;6:157-64.
20. Cullen JJ, Kelly KA, Moir CR, et al. Surgical management of Meckel's diverticulum. Ann Surg 1994;220:564-69.
21. Di Giacomo JC, Coltone FJ. Surgical treatment of Meckel's diverticulum. South Med J 1993;86:671-5.
22. Longo WE, Vernava AM. Clinical implications of jejunoileal diverticular disease. Dis Col Rec 1992;35:381-8.