weighed against the probability of diverticula-associated complications. Symptomatic Meckel's diverticula are resected in both paediatric and adult patients.[3,6]

Enteroliths have been reported in approximately 50 cases of Meckel's diverticula. In 75% of cases they are multiple.[7] One study of 776 cases of Meckel's diverticula reported two cases with enterolithiasis.[8] An Armed Forces Institute of Pathology (AFIP) study of 84 cases of Meckel's diverticula reported eight cases of enterolithiasis in 24 years.[9]

Enteroliths form at a distant site and become lodged in a Meckel's diverticulum (e.g., gallstones, bezoars or faecoliths), or form within the diverticulum. They are usually triangular and flat and have a radiolucent centre.[10] The pathogenesis of enterolith formation remains incompletely understood. The authors were unable to find microscopic descriptions or chemical analyses of enteroliths in Meckel's diverticula. In previous reports it appears the enteroliths have been classified on the basis of clinical and radiological findings and macroscopic features, as either faecoliths, bezoars or gallstones.

In our case, the enterolith contained vegetable matter, bilirubin and calcium oxalate. Oxalate from foods is normally complexed with calcium in the stomach, which prevents excessive absorption and subsequent oxalate crystal disease, which causes renal calculi and arthropathy. Under normal conditions calcium oxalate does not crystallise in the intestines.[11]

The wide necks of most diverticula, along with smooth muscle peristalsis, usually prevent pooling of intestinal contents.[7] Conditions favouring enterolith formation therefore include diverticula with narrow necks, segments of bowel adjacent to anastomotic sites, surgically-created pouches, and segments of bowel proximal to strictures.[12] The alkalinity of the distal small bowel also favours precipitation of mineral salts.[7,9,13] In a Meckel's diverticulum, the absence oxyntic gastric mucosa or the presence of pancreatic mucosa also favours enterolith formation.[9,13]

In our case, it appears that bowel contents were contained in the diverticulum distal to the narrow neck under conditions of stasis. The non-oxyntic gastric mucosa allowed an alkaline environment in which calcium oxalate crystals formed within the mixture of vegetable matter, bile and other bowel contents, resulting in enteroliths.

Enteroliths in Meckel's diverticula cause small bowel obstruction by several mechanisms, including: (1) impaction in the terminal ileum after extrusion from the diverticulum; (2) promotion of diverticulitis, leading to adhesions; (3) formation of a lead point for intussusception. In our case, it is difficult to determine the extent to which the enteroliths contributed to bowel obstruction. The fibrous band, which tethered the segments of ileum, is the most likely direct cause of the obstruction. The relationship between the fibrous band and the enteroliths cannot be determined.

Our case is unusual due to the advanced age at which the Meckel's diverticulum first became symptomatic and the multiple pathological findings. Review of the literature found no previous cases in which both multiple tumours and calculi were found in one Meckel's diverticulum. We also found no cases in which the enteroliths were examined both microscopically and chemically to determine their nature.

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1. Kuwajerwala NK, Silva YJ. Meckel diverticulum. In: Daily BJ, Talavera F, Friedman AL, Zamboni P, Geibel J, editors. *eMedicine, Medscape*. 2 Apr 2015; cited Sep 2016. http://emedicine.medscape.com/article/194776-overview.
2. Dumper J, Mackenzie S, Mitchell P, Sutherland F, Quan ML, Mew D. Complications of Meckel's diverticula in adults. *Can J Surg* 2006; 49: 353–7.
3. Park JJ, Wolff BG, Tollefson MK, Walsh EE, Larson DR. Meckel diverticulum: the Mayo Clinic experience with 1476 patients (1950-2002). *Ann Surg* 2005; 241: 529–33.
4. Yamaguchi M, Takeuchi S, Awazu S. Meckel's diverticulum: investigation of 600 patients in the Japanese literature. *Am J Surg* 1978; 136: 247–9.
5. Martin JP, Connor PD, Charles K. Meckel's diverticulum. *Am Fam Physician* 2000; 61: 1037–42.
6. Lamba HK, Shi Y, Prabhu A. Gallstone ileus associated with impaction at Meckel's diverticulum: case report and literature review. *World J Gastrointest Surg* 2016; 8: 755–60.
7. Kyriazanos ID, Tambaropoulos K, Martinos H, Pechlivanidis G, Davidis D, Noussis G. Meckel's diverticulum lithiasis: a case of small bowel obstruction due to a migrated Meckel's Enterolith. *Indian J Surg* 2006; 68: 41–3.
8. Kusumoto H, Yoshida M, Takahashi I, Anai H, Maehara Y, Sugimachi K. Complications and diagnosis of Meckel's diverticulum in 776 patients. *Am J Surg* 1992; 164: 382–3.
9. Pantongrag-Brown L, Levine MS, Buetow PC, Buck JL, Elsayed AM. Meckel's enteroliths: clinical, radiologic, and pathologic findings. *Am J Roentgenol* 1996; 167: 1447–50.
10. Maglinte D, Herlinger H. Plain film radiography of the small bowel. In: Herlinger H, Maglinte D, Birnbaum B, editors. *Clinical Imaging of the Small Intestine*. Philadelphia: Saunders, 1989; 45–70.
11. Lorenz EC, Michet CJ, Milliner DS, Lieske JC. Update on oxalate crystal disease. *Curr Rheumatol Rep* 2013; 15: 340.
12. van Es W, Sybrandy R. Case 19: enteroliths in a Meckel's diverticulum. *Radiology* 2000; 214: 524–6.
13. Macari M, Panicek DM. CT findings in acute necrotizing Meckel diverticulitis due to obstructing enterolith. *J Comput Assist Tomogr* 1995; 19: 808–10.

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Malignant adenomyoepithelioma of the breast

Sir,

Adenomyoepithelial tumours of the breast are uncommon biphasic tumours composed of ductal and myoepithelial cells initially described by Hamperl in 1970.[1] The World Health Organization (WHO, 2012) categorises adenomyoepithelioma into benign and malignant forms.[2] In the latter, the epithelial component and/or the myoepithelial component shows malignant transformation. We describe a rare case of epithelial-myoepithelial carcinoma (malignant adenomyoepithelioma) in which both the epithelial and myoepithelial components exhibit malignant transformation.

The patient, an otherwise well 78-year-old woman, self-palpated a lump in her left breast. She had no past history

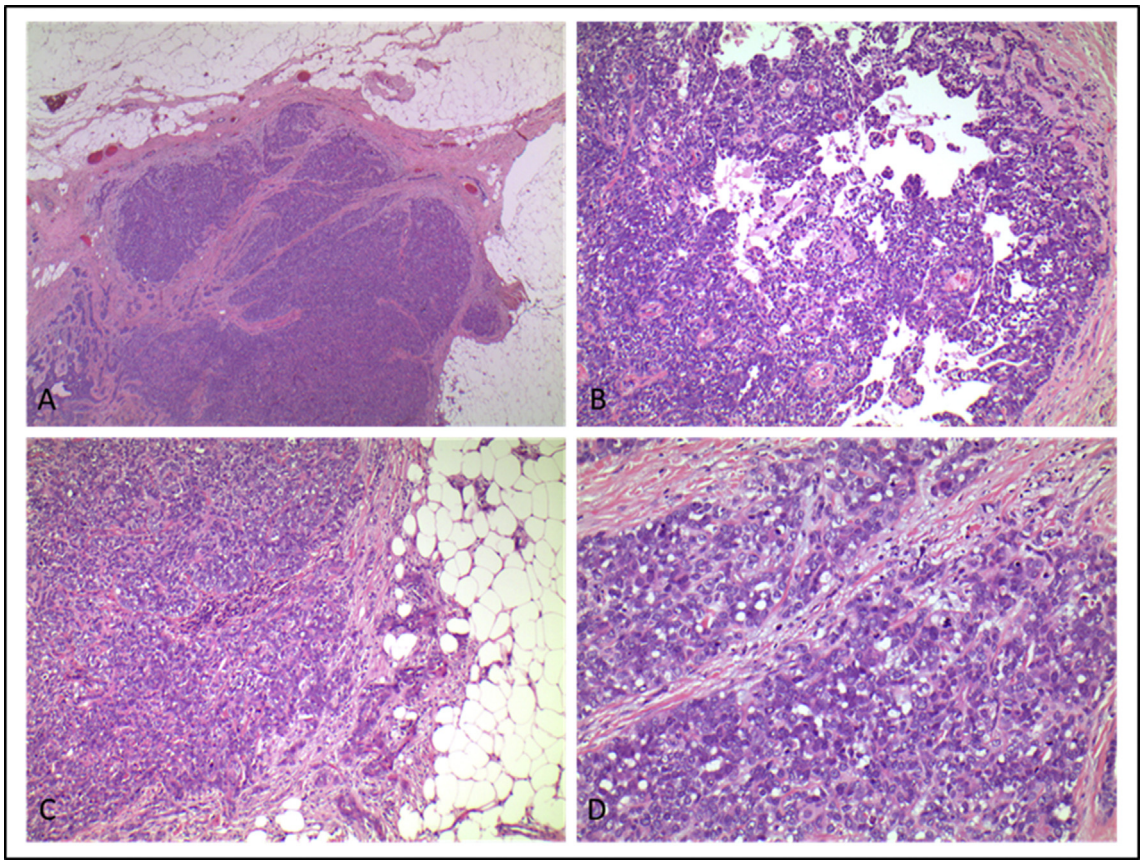

Fig. 1 Microscopic images (H&E stain). (A) Low power shows solid architecture with pushing border. (B) Medium power shows tumour with papillary growth pattern and (C) tumour invading into surrounding adipose tissue. (D) High power shows vesicular nuclei and scattered mitoses.

of breast pathology, although she had two sisters both of whom had mastectomies for breast cancer. Imaging revealed a 1.7 cm irregular, solid mass in the left breast at 7 o'clock, 6 cm from the nipple. A core biopsy of the mass showed a papillary lesion composed of atypical epithelial and myoepithelial cells. The tumour was negative for oestrogen and progesterone receptors, an unusual finding in papillary tumours of the breast, and the possibility of an epithelial-myoepithelial tumour was raised. Complete excision was recommended.

A wide local excision revealed an epithelial-myoepithelial carcinoma with a mixed solid and papillary architecture composed of epithelioid and spindled cells with vesicular nuclei (Fig. 1). Some tumour cells had clear cytoplasm. The tumour was partly well circumscribed, however there were also invasive areas in which cellular atypia and mitoses were more prominent. The myoepithelial component was positive for p63, SMA and CK5/6 (weak) while the epithelial component was positive for CK7 and CAM 5.2 (Fig. 2). Both epithelial and myoepithelial cells were seen in areas with unequivocal invasion and malignant cytology. As with the core biopsy, the excision specimen was negative for oestrogen and progesterone receptors. The Ki-67 index measured up to 10% of tumour nuclei. Two sentinel lymph nodes showed no evidence of malignancy.

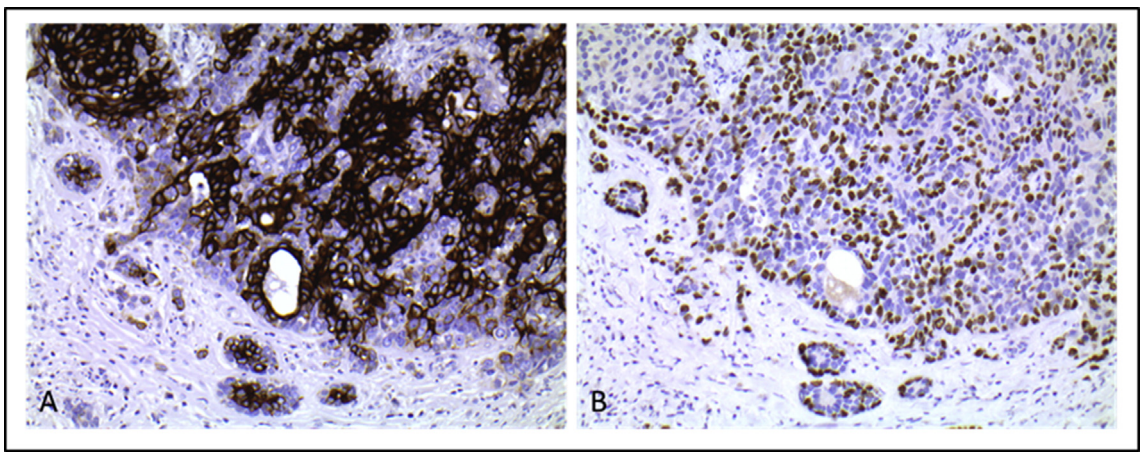

Fig. 2 Immunohistochemistry. (A) The epithelial component showed cytoplasmic immunoreactivity for CAM 5.2. (B) The myoepithelial component showed nuclear immunoreactivity for p63.