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Case Study

A case of small bowel obstruction secondary to multiple adhesions band, technological advances in diagnosis

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Abstract: Adhesion band is a major cause of small bowel obstruction. Traditionally, the obtained results of computed tomography (CT) scan were indicative of adhesion band as an etiology for small bowel obstruction. However, adhesion is easily diagnosed today due to technological advances in radiology and high-quality multidetector CT. It is important to avoid the possible complications of bowel obstruction in the early and appropriate surgical intervention. This article is a report of a 45-year-old woman with abdominal pain and history of previous abdominal surgery. A contrast-enhanced CT scan showed multiple adhesion bands ensued the abrupt narrowing of bowel diameter and closed small-bowel loops obstruction. Furthermore, multiple bands were clearly observed and adhesiolysis was performed in the surgery.

Keywords: Adhesions, Diagnosis, Small bowel obstruction

Introduction

Small-bowel obstruction (SBO), secondary to adhesion, is the frequent cause of admissions in surgical wards. Injury to peritoneum triggers off chemical factors at the site of injury and formation of adhesion bands at the surface of the peritoneum in 80% of cases with a history of surgery. Moreover, peritonitis is the cause of adhesion in 15% of patients. However, the etiology of this condition is congenital or unknown in other cases [1, 2]. The most common cause of adhesion is surgery and in almost 95% of the cases, these bands are potentially obstructive [3]. The prevalence of adhesions can be as early as 3-14 days after the surgical procedure. In 25% of patients, adhesions are formed in a month and 40% of cases in a year [4]. There are two types of adhesions, namely adhesion band and matted adhesion. The former is defined as a band with a length of more than 1 cm, and the latter refers to a band with a length of less than 1 cm. Adhesion band is mostly observed in abdominal surgery; however, matted adhesion is frequently caused by the gynecologic surgery and inflammatory disorders. It is of utmost importance to detect the location and extent of adhesions in the treatment and improvement of clinical symptoms [5].

The CT scan has been shown to be useful in the determination of the site, level, and cause of SBO. However, according to the previous studies on adhesions, the most common cause of SBO is that adhesions are not clearly visualized on CT scan [6-8]. In most cases, the identification of adhesive bands remains a diagnosis of exclusion [6, 7, 9]. The diagnosis of SBO is based on the detection of an abrupt change in bowel caliber in the absence of evidence for the other causes of obstruction. It is important to accurately diagnose the adhesive band SBO since it can be treated without any surgical procedure unless the signs of strangulation are present [2].

Case report

The case in this study was a 45-year-old female patient admitted to Besat Hospital with abrupt generalized abdominal pain associated with nausea and vomiting initiated 6 h before hospital referral. She had the history of two previous abdominal surgeries, including umbilical herniorrhaphy (16 years ago), and cholecystectomy (a year ago). Physical examination revealed focal tenderness in the midportion of the abdomen, without abdominal distention. Rectal examination was normal.

The routine blood test showed only mild leukocytosis (WBC: 14600); moreover, the upright abdominal X-ray indicated the suspicious signs of bowel obstruction. Abdominal ultrasonography was unremarkable, except for some dilated fluid containing loops. An abdominal CT scan with oral and intravenous contrast was performed with a 16 slice multi-detector computed tomography (MDCT) scanner (Somatom GE health care, General Electric, USA). The CT parameter entailed 1 mm detector collimation, 8 mm slice thickness, and 1.5 mm reconstruction interval. Oral contrast was diatrizoate meglumine. Scanning started 70 sec after the IV injection of 100 ml of contrast iodixanol (300 mg I/ml, visipaque 300 mg I/ml, GE health care) at an injection rate of 2-3 ml/sec, which confirmed a small bowel obstruction secondary to multiple adhesion band.

There was a dilated loop in the mid-zone of jejunum with a maximum diameter of 33 mm and abrupt change in bowel

caliber. Multiple bands measuring 10-30 mm in the left side of the peritoneal cavity were observed with the abrupt narrowing of the mid jejunal loop and the cross of the fibrous band over the loops. The observed evidence of fat notch sign (focal extraluminal compression of bowel loop) ensued near-complete obstruction. There was no evidence of mass or lymphadenopathy.

The provisional diagnosis of the surgical team was a mechanical SBO. The decision was made to perform an emergency laparotomy for adhesiolysis. The laparotomy indication of multiple adhesion bands led to jejunal loop obstruction. The patient was subjected to adhesiolysis to remove the bands. The patient recovered uneventfully and was discharged on the third postoperative day. There was no recurrence on the follow-up.

Figure1. Coronal computed tomography image indicating main adhesion band cross over the jejunal loop, transition point, and distal collapsed bowel; presence of "beak sign" (abrupt luminal transition)

Figure2. Sagittal computed tomography image showing the adhesion bands and focal obliteration of pro-peritoneal fat line

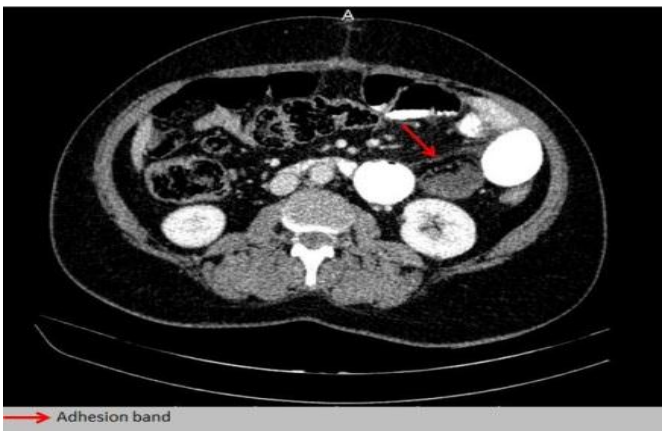

Figure 3-5: Axial computed tomography images for multiple smaller adhesions band

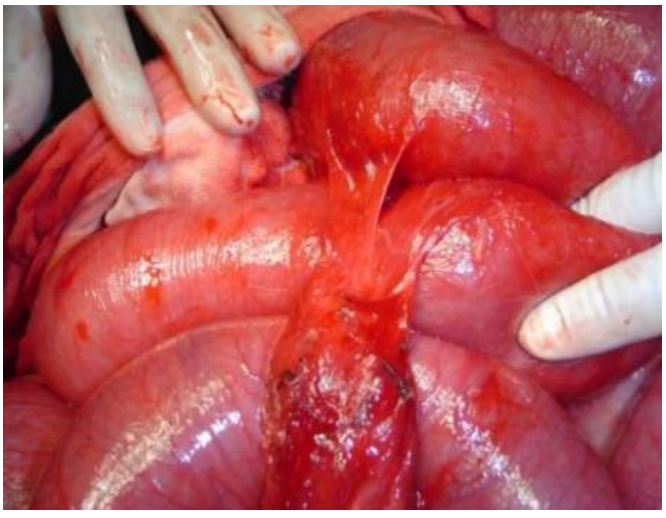

Figure 6 – 7: Exploratory laparotomy indicating multiple adhesions band

Discussion

The CT scan is the modality of choice for the diagnosis of SBO [10]. According to a multiplanar study, the sensitivity and specificity of the CT scan in the recognition of the site and level of SBO were 94–100% and 90–95%, respectively [11, 12]. Regarding the sensitivity, accuracy, and specificity of CT scan, Scrima et al. in their recent systematic review emphasized that CT scan should be performed for all the patients suspected with SBO [13].

The importance of this radiological examination is due to the discriminating power of CT scan in distinguishing patients who require surgery from those who can be treated clinically. The CT scan is known as a road map for the diagnosis of adhesion before laparoscopic or surgical adhesiolysis. However, it is traditionally believed that adhesion is not obviously observed even in the multiplanar reconstruction [14, 15] unless it is complicated with carcinomatosis or inflammatory process [7, 16].

In s study conducted by Petrovic et al., the extraluminal band (conformation of transition zone) had a high positive predictive value for adhesive SBO (71%). Sensitivity and specificity of the extraluminal band for adhesive obstruction was 61% and 63%, respectively [8]. Other indirect signs included extrinsic indentation, kink of a bowel loop, or distortion of the mucosal fold [17]. The presence of "beak sign" (abrupt luminal transition, luminal constriction) and "fat notch sign" are indicative of adhesive band SBO representing focal extraluminal compression due to the peritoneal band [18]. Fat notch sign is a more specific finding and a reliable indicator of extraluminal compression by adhesion band [18]. However, "small bowel feces sign" is more commonly seen in the matted adhesion [2]. The focal obliteration of properitoneal fat line is also another sign of adhesion [19], which is observed in axial and sagittal reconstruction images.

Adhesion may be vascularized and show enhancement in the post-contrast images. Our patient had a history of two abdominal surgery, namely umbilical hernia and cholecystectomy, with the evidence of inflammation in the surgery. Furthermore, the obtained results of MDCT were indicative of surgical or nonsurgical approach for adhesive SBO. In a study performed by Chang et al. [20], it was concluded that intraperitoneal fluid, mesentery fatty stranding, high-grade obstruction, and the absence of "small bowel feces sign" have high sensitivity and specificity for adhesion-related surgical SBO [20]. In the presence of all four findings, the diagnosis of surgical SBO could be made with high sensitivity and specificity of 98.6% and 90.9%, respectively. In our case, three of these signs (high-grade obstruction, mesenteric fatty stranding, and absence of feces sign) represented surgical adhesions.

The complication of SBO is more common in the band adhesion. In a study conducted by Eric et al., ischemia and necrosis were observed in 41% and 26% of the cases with adhesion band, respectively. However, only 10% and 5% of the patients with matted adhesion had the complication of ischemia and necrosis, respectively [18]. Moreover, 50% of cases had a single adhesive band [21]. Andrew et al. reported that a CT scan was highly significant ($P<0.01$) in the prediction of surgery outcomes. This finding encompassed the presence of transition point and congestion of mesentery and closed-loop obstruction [22].

In the recent meta-analysis carried out by Liu, it was concluded that the accuracy level of CT and MRI in the detection of small bowel obstruction are the same [23]. Additionally, Scrima estimated that the sensitivity of CT scan for the prediction of urgent surgery was 86.7% [24]. Millet el al. reported that reduced the bowel enhancement, diffused mesenteric haziness, and closed-loop mechanism of obstruction were important and associated with strangulation. When two or three of the above-mentioned CT findings were present, the high values related to the likelihood ratio of strangulation were 14.7 and 43.8, respectively [25].

In our case, multiple adhesion bands were detected and there was no evidence of strangulation and ischemia. Traditionally, the diagnosis of adhesive through CT scan was based on the exclusion of other causes. In most cases, treatment was performed with the presumptive diagnosis. However, new advances in spatial resolution, such as 64–slice MDCT and multiplanar reconstruction protocol, could improve the visualization quality of the adhesive band, especially in the patients with abundant adipose tissue [26]. Caoili et al. emphasized that the detection and better delineation of the transition zone were possible in coronal reconstruction images [27]. It should be noted that the detection of thin adhesion needs localizing features, such as triangulation of picture archiving and commutating system [19]. Consequently, the multiplanar capabilities of CT make this modality feasible for visibility of the adhesive band, which can improve the surgical outcome and prognosis of patients.

Conclusion

In recent MDCT with multiplanar high-quality reconstruction images, direct detection of adhesion bands are more feasible, compared to the past. Moreover, technology advancement in CT scans makes detection of serious adhesions requiring surgery possible.

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