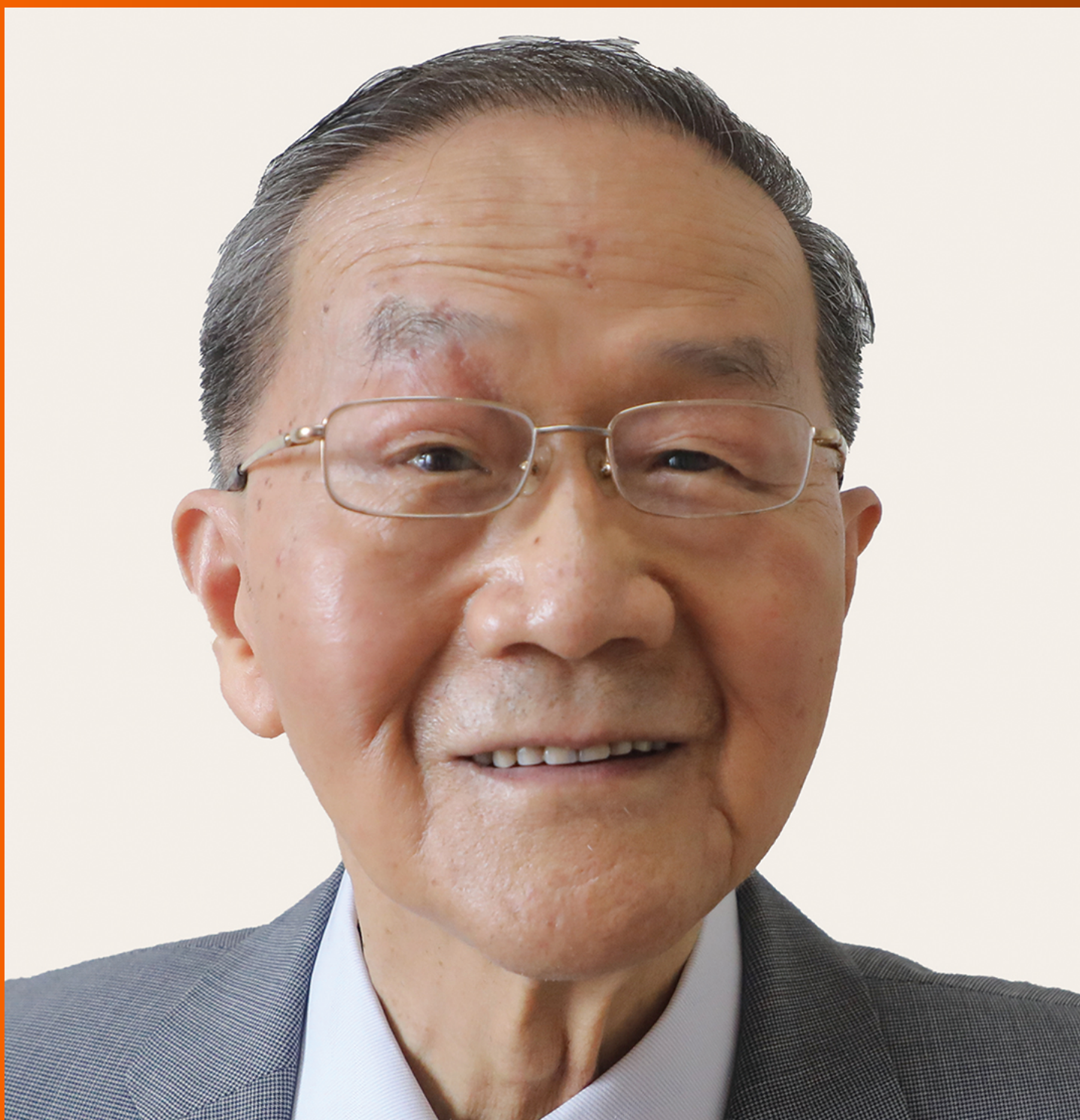


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Prediction factors for ischemia of closed-loop small intestinal obstruction

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Abstract

A closed-loop type of intestinal obstruction leads to ischemic necrosis. There have been indicators that may predict ischemia and its severity, such as biomarkers and computed tomography scans. In addition to the usual inflammation markers, such as white blood count-neutrophil count and c-reactive protein (CRP), the most accurate predictors that have been proposed are the CRP-to-albumin ratio, the neutrophil/lymphocyte ratio and the platelet/lymphocyte ratio. Endothelin 1 is another promising biomarker of ischemia that must be assessed in daily clinical practice. Advanced age and frailty status were assessed as predictors of mortality. A timely operative procedure without any delay ensures a better outcome.

Key Words: Acute abdomen; Obstructive ileus; Bowel ischemia; Closed loop; Predictive factors; Inflammatory markers

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Core Tip: Early recognition of closed loops is important to interrupt ongoing ischemia by prompt surgical intervention, especially for older age patients. In such a case, we achieve avoidance of bowel necrosis and enterectomy as well as septic complications, which ultimately resulted in an improved outcome. Endothelin 1, c-reactive protein and leukocyte-neutrophil count must be more often used in daily practice as a severity marker of small bowel ischemia.

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TO THE EDITOR

It was very interesting to read the recent paper by Toneman *et al*[1]. We were pleased and enlightened by their excellent work. This retrospective trial included 148 patients who underwent surgery for suspected closed-loop small bowel obstruction; the sample size was adequate. After assessing several parameters, the authors concluded that older age and an American Society of Anesthesiologists score ≥ 3 were prediction factors of irreversible ischemia. We completely agree with their conclusions because their conclusions are reasonable in that both conditions are associated with an increased risk of reduced tissue blood supply. Thus, the manifestation and progression of intestinal ischemia is faster. Early surgical operation prevents necrosis that leads to bowel perforation causing severe peritonitis and subsequent severe sepsis. The topic is very interesting, and it prompts certain thoughts and observations.

Intestinal obstruction is a common clinical occurrence in the acute surgical setting, with an incidence ranging from 12% to 16%, and is a causative factor for morbidity and mortality worldwide (2%-8%). The most common causes of obstructive ileus of the small intestine are adhesions (60%-70%) and hernia incarceration (20%). The obstruction may be complete, partial, incarcerated or closed-loop type. Questions, such as whether there is an obstruction, where is it located, what is the cause, whether there is ischemia and which are the management choices? In addition to patient history, clinical examination, laboratory tests and plain abdominal radiogram, computed tomography (CT) is the gold standard, with a sensitivity and specificity up to 95%. CT findings include intestinal wall thickening (> 3 mm) and abnormal enhancement, edema of the mesentery, fluid in the mesentery and/or peritoneal cavity, dilatation of veins, a closed-loop obstruction or volvulus, and in advanced cases, intraperitoneal gas, mesenteric or even portal venous gas[2].

The term closed loop means obstruction of two parts of the intestinal loop at the same point, including the mesentery. The mucosa continues to produce secretions, causing distention and wall edema, followed by blood supply disturbances and ischemia. It is crucial to assess bowel viability during the operation. A pink, edematous and thickened bowel is at low risk for ischemia. Violaceous or cyanotic serosa should be kept warm and observed for 15 to 20 min. If perfusion is not improved and viability remains questionable, Doppler ultrasound or a fluorescein dye should be used to evaluate the blood supply[3].

There has been no preoperative finding of an ideal biomarker for predicting the outcome. C-reactive protein (CRP) is a useful biomarker that may predict the clinical course[4,5]. Levels higher than 50 mg/L indicate moderate inflammation and levels above 150 mg/L indicate potential necrosis. Nevertheless, clinicians should obtain CT scans of obstructive ileus; in such cases, imaging should be performed immediately without delay. However, the ratio of CRP to albumin (CRP/Alb) is the most accurate indicator for predicting the severity of inflammation and the outcome, as recently reported. Values of CRP/Alb > 1.32 have a sensitivity of 94% and specificity of 70% for intestinal ischemia[6]. Other markers, including L-lactate, D-dimers, white blood count, neutrophil/lymphocyte ratio (NLR) and platelet/lymphocyte ratio (PLR), have no particular prognostic value[4,5,7]. Otherwise, in another study, NLR > 4.5 and PLR > 157 were independent predictors of outcome[8]. The univariate analysis showed that leukocyte and neutrophil counts were predictors of mortality, and the multivariate analysis showed that age was a predictor of mortality[7].

Endothelin 1 (ET-1) is a vasoconstrictive peptide derived from vessel endothelium that has been used as a biomarker of ischemic damage severity in experimental models[9-11] but also occasionally in clinical studies, in which it is increased in mesenteric ischemia[12,13]. ET-1 and CRP must be more often assessed in daily practice as markers of small bowel ischemia.

Other experimental biomarkers of ischemia include tumor necrosis factor-alpha, P-selectin, antithrombin III, and intracellular adhesion molecule-1[9]. Research is focused on these biomarkers and may indicate a future perspective. Treatment to avoid both an unnecessary operation and a missed diagnosis of bowel ischemia must be carefully decided. A prediction model has been introduced for the latter, indicating surgical management instead of conservative management. Surgical management is indicated for CT findings, including intraperitoneal free fluid, mesenteric edema and lack of small bowel feces signs, and a history of vomiting[14]. In conclusion, a closed-loop small intestinal obstruction must be excluded in the initial stage of an investigation. Acute phase proteins and cooperation between surgeons and radiologists is important, since a prompt operation ensures a better outcome.

FOOTNOTES

Author contributions: Pavlidis TE designed research, analyzed data and revised the paper; Pavlidis ET performed research, analyzed data and wrote the paper.

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