

High Intensity of Exercise and Ischemic Colitis

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ABSTRACT

Many of scientific evidence suggest that physical exercise has beneficial effects by increase aerobic capacity, prevents the progression of disability, reduces the risk factors of cardiovascular and endocrine disease, improves gastrointestinal function, lessen anxiety and depression, and results in promote health. However, the effect of exercise on gastrointestinal tract also has an adverse effect. Ischemic colitis is one of these. With the increasing popularity of endurance competition among the population, gastrointestinal (GI) complaints are very common, especially in endurance athletes and often impaired performance or subsequent recovery. The symptoms may include nausea, vomiting, abdominal pain and bloody diarrhea. Because of blood flow to gastrointestinal tracts is reduced during an exercise and this is believed to the process of development of GI symptoms. In generally, ischemic colitis, after vigorous physical exercise, is reversible or irreversible depend on the onset of ischemic occur but it can indeed be serious and life threatening. The case we present in this paper highlight on how exercise inducing ischemic colitis and the other conceivable factor. This review is focus on the prevalence of colitis in athletes, pathophysiology and the treatments of colitis. However, the all clear mechanism of the pathology and the actual prevalence need still further investigate.

Key words : Exercise, ischemic colitis, athletes, splanchnic hypoperfusion

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Ischemia colitis was divided into two groups; occlusive disease and nonocclusive disease. This is deleterious manifestations on the colon that affect to decreased blood flow in mesenteric artery and lead to ischemia. Normally, ischemic colitis usually occurs in the elderly patients that related to degenerative changes in the vascular system. However, the strenuous exercise can affect the mucosal erosion and ischemic colitis after long distance running⁽¹⁾. Follow-

ing by colonoscopic inspection reveals the changes of epithelial surface induced to ischemia and other problems of lower gastrointestinal tract⁽²⁾. From the inspection, Also found the ischemic colitis occur at proximal, distal, or pancolitis even small bowel and in required surgery cases^(2,3).

The etiology of ischemic colitis in endurance athletes is absolutely unclear, possible from the multifactorial factors as follows;

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Splanchnic hypoperfusion

Splanchnic hypoperfusion (reduced blood flow) can occur during exercise from mild circulatory changes to profound gastrointestinal ischemia⁽⁴⁾. The result of hypoperfusion in the gastrointestinal tract such as damage epithelial cells, changes of permeability and epithelial barrier function, also different in individuals. During of intensive exercise, norepinephrine is released from nerve ending and bind to alpha-adrenoreceptors of the sympathetic nervous system induces vasoconstriction. These will increase the total splanchnic vascular resistance^(5,6). The decreased of blood flow to splanchnic flexure will occur more when the intensity of exercise have more than 80% of VO_2 max. In contrast, the maximal exercise lowers than 80% of VO_2 max may be increased blood flow to splanchnic flexure⁽⁷⁾.

Impaired absorption and permeability

The effect of exercise on absorption in gastrointestinal tract act both water and carbohydrate. From the study of Oktedalen et al.⁽⁸⁾ revealed that after extreme exercise will increase the permeability of gut and damage the gut, resulting impair the gut function. Similarly in the colon during extreme exercise can damage to epithelial cells of colon, impair permeability function and result in bacterial translocation (LPS).

Mechanical causes

The posture of the athlete in each of exercise is different pattern that it related to the ischemia colitis. For instance, endurance runners have high mechanics while running and consequent damage to the gastrointestinal tract. The repetitive bumping of the internal organs in lower gastrointestinal tract is contributed to lower gastrointestinal symptoms such as flatulence, diarrhea and urgency. The mechanical of trauma suffered by the lower gastrointestinal from repetitive impact of running, in combination with colonic ischemia, likely account for gastrointestinal bleeding. On a bicycle, athletes with bicycle position increased the pressure on abdominal that effected to upper GI symptoms.

Other contributing factors

Before race, many athletes use of non-selective non-steroidal anti-inflammatory drugs (NSAIDs) for relieve their pain after practice. They have increased a risk three- to five-fold of lower GI complications such as mucosal bleeding or perforation compared to no

medication⁽⁹⁾. There are the environment factors such as dehydration, hyperthermia, and iron deficiency anemia in athletes.

Case reports

Surveys of Marathon runner, up to 60% complaint about gastrointestinal symptoms during or after a competition, include bloating, epigastric pain, abdominal cramps, diarrhea and fecal incontinence, with lower gastrointestinal tract symptoms occurring more frequently than upper⁽¹⁰⁾. However, the symptoms of gastrointestinal tract may differentiate varies in sex, age, trainings status of athletes as well as mode and intensity of exercise and environmental conditions. Ischemic colitis is one of the gastrointestinal problems. It normally often occurs in elderly people who have endothelium dysfunction and include a range from mild to severe condition⁽¹¹⁾. At present, many studies reported that colitis also found in the groups of endurance sports athletes (i.e. Marathon runner, Triathlon sports, etc.).

One case report presented about the male patient who enter the triathlon events in Australia and face with ischemic colitis. He presented with the right-sided abdominal pain and bloody diarrhea after the events and he had an experienced episodic the same symptoms over the 2 months during his training program. On examination by computed tomography (CT) scan of his abdominal show about the cecum and right colon consistent with ischemic colitis but not severe stage, then he was treated conservatively method and 4 days later he was discharged⁽¹²⁾. Likewise, a male military patient with no medical history presented the sudden abdominal pain, vomiting and sweating during his high intensity body built training program. Five hours later the patient has rectal bleeding and still has abdominal pain. An examination by colonoscopy revealed deep ulcers from sigmoid-rectum junction and diagnosis with the ischemic colitis. So the patient was treated in the conservative method and after that the symptoms is relief⁽¹³⁾. In addition, a 31 year old amateur sportsman with no medical history note, who enter the marathon events admitted to hospital with the abdominal cramps at the right iliac fossa, rectal bleeding, dizziness and severity pain at abdominal. On the examination CT scan show about ischemic colitis of the cecum and ascending colon. Finally the patient subsequently underwent a laparotomy and right hemicolectomy with ileostomy formation⁽¹⁰⁾. Then the severity stage of

colitis observed by endoscopy or histology can lead the treatment into the appropriated way for the patient. According to the cases report, the duration of ischemic occurs is important because if the ischemia is severe enough, damage becomes irreversible and area of necrosis is spread and lead to the operation treatment in patient. About anatomy of colon and pathophysiology mechanism of the disease indicate that every segment of the colon can be affected by ischemic colitis. The mainly reported is the left side of the transverse colon to the descending colon⁽¹⁴⁾. During exercise the sympathetic nervous system is stimulated resulting in a blood vessel vasoconstriction of splanchnic artery and shunting blood towards the muscles^(8,15,16), called splanchnic hypoperfusion. At normal, bowel can tolerate up to 75% reduction in mesenteric blood flow for up to 12 hours but in exercise at 70% of maximal oxygen consumption (VO_2 max) causes a blood flow reduction up to 60-70% and more intense exercise can reduce up to 80% by the releasing of catecholamine from adrenal medulla to maintain blood flow in active organ⁽¹⁴⁾. Another study about the effects of exercise on mesenteric blood flow by transcutaneous doppler ultrasound suggests that superior mesenteric artery blood flow decreased by 43% immediately after the end of the exercise and by 29% at five minutes and 24% at 10 minutes post exercise in healthy volunteers⁽¹⁷⁾. Moreover, the sympathetic tone can decrease gastrointestinal motility and linked to abdominal pain or gastrointestinal reflux during the exercise. There is a study indicate that the gastrointestinal reflux can caused by abdominal bouncing or compression of the viscera by abdominal muscles during exercise. There are some other factors that may relate to the gastrointestinal ischemic colitis problems. Firstly, the nonsteroidal anti-inflammatory drug (NSAID) is the possible factor that leads to gastrointestinal tracts problems.

A 20 year old marathon runner female patient with the history of ibuprofen presented with dark red bloody diarrhea after the competition. By the treatments and advised to discontinue ibuprofen. Her diarrhea resolved spontaneously. The next factor is about dehydration, it can be worsened by catecholamine suppression the thirst respond center during exhaustive exercise⁽¹⁴⁾. Hyperosmolar sport drink is believed to cause the diarrhea and dehydration too by create a transluminal shift of water into the colon. Hyperthermia stage is the one important factor which will happen together with dehydration in patient, it can lead into the ischemic

colitis condition because changing in viscosity blood can reduce the flow at all blood vessel⁽¹⁴⁾.

The last factor is about a past history of patient. In 2012, there is a unique case report with a patient 29 years old with history of Crohn's disease (bowel inflammation) presented with two days of diarrhea and hematochezia after strenuous running. On the examination the patient was diagnosis as a Crohn's disease same as before but her symptoms not related to either the Crohn's disease or colitis disease. Finally she was trial treatment for ischemic colitis disease, luckily the treatments can resolved her symptoms⁽¹¹⁾. Some researchers propose that iron deficiency stage and anemia may be related to gastrointestinal problems. A long distance runner, 20 years old female patient with the history of hemorrhoidal bleeding was referred for evaluation of an iron-deficiency and guaiac-positive stools. Though out the entire year, she has an bloody diarrhea and hematocrit fell after the competition or intensive trainings. After graduation she stopped competition running and has had no future guaiac positive stools or anemia. However, the clinical implications of iron depletion are unclear⁽¹⁸⁾.

Prognosis

The colonoscopy is the mostly use technique for diagnosis of ischemia colitis because it has highly sen-

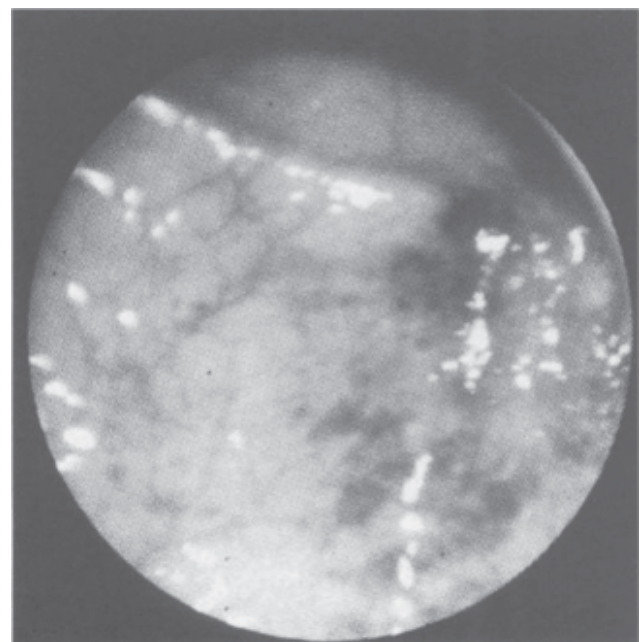


Figure 1. Endoscopic appearance of acute ischemia colitis in the 29 year-old-woman after vigorous exercise⁽¹¹⁾.

sitivity and specificity for assessment the pathology. The almost cases of ischemic colitis have good prognosis with diminished their symptoms within 24-48 hours and it will fully recovery within 1 to 2 weeks. The improvement of the symptom upon the disease's area is related to the time of recovery in the individuals. The patients with transient ischemic colitis may be stricture or stenosis will improve with their own in 12 to 24 months without therapy. The combination of colonoscopy and barium enema can help to assess and resolution for stricture or persistent colitis, or both. If necessary to operation 10-65% of the patients have high rate of mortality especially in the patients with pancolitis. In addition, about 20-30% of patients with colitis from irreversible ischemic injury, they remain shown some symptoms such as diarrhea, rectal bleeding and/or weight loss. In some area of the segmental colitis can recurrent the sepsis in part of unrecovered so they consider the operation to manage this condition⁽¹⁹⁾.

Interestingly, right colon associated with long hospitalizations because it's a greater need area for surgery and become higher rate of mortality. The right colon has main blood supply from superior mesenteric artery so aorto-iliac surgery maybe affect to poor outcomes for patients' development after surgery. These effects happen on ischemic colitis patients with myocardial infarction, chronic renal failure, or patients on hemodialysis⁽¹⁹⁾.

CONCLUSIONS

From many studies, we conclude that the patient developed segmental ischemic colitis as a direct effect of vigorous, high intensity, long distance running. As the major result of a hypoperfusion in intestinal blood flow that can produce the severity of damage but others factor which can cause ischemic colitis still need more investigate. The diagnosis requires a high index of suspicion and the treatments should consider appropriate with the severity of the patient. Although most patients improve within several days with conservative care, others will require laparotomy with bowel resection.

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