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Digestive disorders in athletes
Tulburări digestive la sportivi

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Abstract

Physical activity has positive and negative effects on the health status in general and on the digestive organs in particular. Sustained physical effort may cause digestive tract maladies.

The incidence of digestive tract diseases in athletes is 20-68%. It depends on the type of sport: for example, runners present digestive disorders more often than cyclists and these disorders appear in triathlon athletes more frequently during the running event. Digestive maladies triggered by physical activity are seen mostly in women and young people, especially when the exercises are done 2-3 hours after eating, and are increased by dehydration.

The most encountered gastrointestinal disorders in athletes are transient abdominal pain, gastroesophageal reflux disease, abdominal discomfort with vomiting, acute diarrhea, upper and lower gastrointestinal bleeding, intestinal ischemia and gastrointestinal infections. Among these disorders, abdominal pain is the most frequent.

Keywords: digestive disorders, athletes.

Rezumat

Activitatea fizică are efecte pozitive şi negative asupra stării de sănătate în general, şi asupra organelor digestive în particular. Efortul fizic susţinut poate cauza afecţiuni ale tractului digestiv.

Afecţiunile digestive se întâlnesc la sportivi cu o incidenţă de 20-68%. Incidenţa diferă în funcţie de tipul sportului practicat, astfel alergătorii prezintă mai frecvent decât cei care practică ciclismul tulburări digestive, la sportivii care practică triatlon aceste acuze apar mai des în timpul probei de alergare. Afecţiunile digestive declanşate de practicarea sportului sunt mai frecvente la femei şi la tineri, mai ales atunci când exerciţiile sunt efectuate la 2-3 ore după masă şi sunt accentuate de deshidratare.

Tulburările digestive la sportivi sunt durerea abdominală tranzitorie, boala de reflux gastroesofagiană, discomfortul abdominal şi voma, diareea acută, hemoragia digestivă superioară şi inferioară, ischemia intestinală şi infecţiile gastrointestinale. Dintre acestea, durerea abdominală este cea mai frecventă.

Cuvinte cheie: afecţiuni digestive, sportivi.

Introduction

Over the past decades, a large part of the global population has adopted a sedentary lifestyle, with important repercussions on the health state. A person is considered sedentary if he or she does not perform light physical exercise for at least 30 minutes, 5 days a week, or intense physical exercise for 20 minutes, 3 days a week. Over the past two decades, the number of sedentary persons has decreased; however, studies show that approximately 40% of the earth's population lives a sedentary life (Cordero et al., 2014).

Lately, sport has become an increasingly popular passion, particularly in West European countries. The practice of a sport has many beneficial effects on the organism: prevention of cardiovascular diseases, diabetes mellitus, obesity, constipation, and cancer, particularly in the gastroenterological area. In addition to these beneficial effects, a multitude of gastroenterological disorders, such as pyrosis, vomiting, abdominal pain, meteorism, flatulence, watery diarrhea, digestive hemorrhage, anal incontinence occur, all in direct relation with the intensity and duration of training (Gil et al.,1998; Thalmann et al., 2006; Peters et al., 2001).

The incidence of gastrointestinal symptoms varies between 25-60%, being dependent on several factors including age, sex, duration and intensity of training, or diet. The most affected athletes have proved to be participants in the marathon and triathlon. Triathlon athletes report gastrointestinal disorders much more frequently during the

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running event compared to the cycling or swimming event (Kwon & Lamont, 2013; Sullivan, 1987).

The exact mechanisms that determine the appearance of gastrointestinal symptoms in athletes are not completely understood. A number of triggering factors are suspected, which include the decrease of mesenteric blood flow, the alteration of gastrointestinal perfusion and permeability, neuroendocrine changes, intestinal motility disorders due to diet, mechanical trauma and hypertrophy of the psoas muscle with compression of the transverse colon (Dimeo et al., 2004; Rao et al., 2004).

The most frequent complaints reported by marathon runners are specific to lower gastrointestinal disorders and consist of diarrhea, anal incontinence and abdominal pain. Upper gastrointestinal involvement (pyrosis, nausea and vomiting) is less common (Sullivan, 1987; Keeffe et al., 1984).

Transient abdominal pain

It is one of the most frequent symptoms described by athletes. One third of long-distance runners, particularly inadequately trained young athletes, complain of transient abdominal pain related to the performance of physical exercise (Dimeo et al., 2004; Morton & Callister, 2000). It is described as transient stabbing or cramping pain, with onset during exercise, more frequently located in the flanks and more rarely in the right or left hypochondrium (Dimeo et al., 2004; Morton & Callister, 2000).

The pathogenesis of abdominal pain is not very well known. Symptoms occur during physical exercise, while during rest the athlete is asymptomatic. Several mechanisms are suspected, which include the mechanical trauma and injury of the intestinal mucosa, the increased mobilization of the kidneys during ampler respiration in exercise, bloating, intestinal spasm, abdominal muscle cramps, intestinal motility disorders and decrease of splanchnic blood flow (Kwon & Lamont, 2013; Dimeo et al., 2004). Dimeo et al. noted that the mechanical stimulation of the intestinal mucosa during running induces the release of prostaglandins and vasoactive peptides from the intestine, which cause in turn intestinal muscle contraction with secondary abdominal pain (Dimeo et al., 2004).

This symptom is generally completely eliminated by the cessation of physical exercise or the reduction of its intensity. Some procedures have proved to be less effective: the leaning forward of the body and the tensing of abdominal musculature or deep inspiration followed by expiration with the mouth almost closed (Kwon & Lamont, 2013; Dimeo et al., 2004; Plunkett & Hopkins, 1999).

Gastroesophageal reflux

Intense physical exercise favors gastroesophageal reflux. The most frequent symptoms reported by athletes are pyrosis and regurgitation in a 10% proportion (Peters et al., 1999). The incidence is much higher in long-distance runners compared to cyclists. Collings et al. evidenced that gastroesophageal reflux disease is much more frequent in weight lifters compared to runners or cyclists (Peters et al., 1999).

A direct mechanism for the development of gastroesophageal reflux in athletes is not known, but the reduction of splanchnic blood circulation, an increased relaxation of the lower esophageal sphincter and a decrease of esophageal clearance are considered to be involved. The type of exercise and fluid or food intake before or during physical exercise seem to be among the most important triggering factors (Peters et al., 1999; Parmelee & Moeller, 2004).

Clark et al. demonstrated the presence of longer gastric reflux periods at the level of the esophagus during long-distance running events and in athletes performing sports events postprandially (Peters et al., 1999). Kraus et al. noted that the administration of 300 mg ranitidine one hour before physical exercise reduces the frequency and duration of reflux episodes in athletes (Peters et al., 1999). In another study carried out in runners, proton pump inhibitors were administered and the decrease in the frequency and duration of reflux symptoms was recorded by esophageal pH-metry (Peters et al., 1999).

Nausea and vomiting

Nausea is much more frequent in runners compared to vomiting; up to 26% of athletes complain of this symptom during physical exercise. The etiology of nausea and vomiting induced by exercise is similar to that of gastroesophageal reflux and refers to the alteration of intestinal motility and the delay of gastric emptying (Kwon & Lamont, 2013; Sullivan, 1987; Plunkett & Hopkins, 1999; Murray, 1987). Dehydration and water electrolyte imbalance caused by intense physical exercise enhance these symptoms (Kwon & Lamont, 2013).

For prevention, it is recommended to avoid the consumption of hyercaloric and fat-rich food approximately three hours before competition. The main treatment for stopping nausea and vomiting is the reduction or cessation of physical exercise and adequate hydration (Kwon & Lamont, 2013).

Acute diarrhea

Diarrhea, along with the imperative sensation of defecation, are very frequent in athletes participating in endurance events (marathon or triathlon), with a higher incidence in female athletes (Sullivan, 1987; Rao et al., 2004). It is suggested that the diarrrheal syndrome occurs because of the association of a number of factors such as pre-competition stress, a high intensity of physical exercise and eating before competition (Kwon & Lamont, 2013; Sullivan, 1987).

Several mechanisms involved in the etiology of this disorder are under discussion: mesenteric ischemia, mechanical trauma, physical and mental stress, alteration of intestinal absorption or permeability, neuroendocrine disorders. The alteration of the intestinal tract motility is considered to be the main factor (Kwon & Lamont, 2013; Rao et al., 2004). Rao et al. report that during moderate physical exercise (walking for up to 4 hours), the migratory myoelectric complexes generating intestinal peristaltic waves are almost absent (Rao et al., 2004). In marathon runners, it was found that diarrheal syndrome and intestinal irritation are frequent, which suggests that physical exercise accelerates intestinal transit (Rao et al., 2004). Rao et al. tried to find a correlation between diarrheal

stools and intense physical exercise using telemetric pH measurements, with an enteral capsule. The results showed that in the majority of athletes, the duration of intestinal transit was the same in the group who performed physical exercise and the group at rest (Rao et al., 2004). An acceleration of intestinal transit may lead to deficient absorption of nutrients important for muscle contraction or may cause the accelerated passage of the small bowel content into the colon, along with biliary salts, leading to diarrhea (Kwon & Lamont, 2013; Rao et al., 2004).

The best way to prevent diarrhea induced by intense physical exercise is to avoid fat-rich foods, carbohydrates and hypercaloric foods several hours before training (Butcher, 1993). It is most frequently necessary to stop exercise and rehydrate because these symptoms may cause water electrolyte imbalance. If diarrheal symptoms are associated with nausea, vomiting or digestive hemorrhage, ischemic colitis or infectious gastrointestinal causes must be suspected (Kwon & Lamont, 2013; Rao et al., 2004).

Gastrointestinal hemorrhage

Digestive hemorrhage is the most important complication that occurs in athletes participating in endurance events. This is frequently occult, transient, and it rarely has a clinical or life threatening significance (Peters et al., 2001). Occult hemorrhage is associated with iron deficient anemia and the secondary impairment of the athlete's performance. Other causes of anemia might be dilution pseudoanemia, due to plasma expansion or mechanical intravascular hemolysis following repeated kicks or hand strikes in contact sports (Kwon & Lamont, 2013; Telford, 2003).

The incidence of occult digestive hemorrhage after a competition varies between 8-85% (Halvorsen, 1986). In a study performed on athletes participating in the ultramarathon, a race longer than 200 kilometers, it was found that 87% of the participants had digestive hemorrhage, demonstrated by positive stool tests for occult hemorrhage. The incidence of digestive hemorrhage increases proportionally to the distance run by marathon runners (Peters et al., 2001; Kwon & Lamont, 2013; Dimeo et al., 2004).

The etiology of digestive hemorrhage induced by physical exercise is not clear. It is suspected that mechanical intestinal trauma during running due to repeated impact along with mesenteric ischemia might cause gastrointestinal hemorrhage. The origin of hemorrhage could be found at any level of the gastrointestinal tract. In a study carried out in 16 long-distance runners, upper digestive endoscopy detected various degrees of gastritis, and four of the runners had a positive Hemoccult test (Sanchez et al., 2006). Another observation reports hemorrhagic gastropathy lesions, gastric ulcer, ischemic colitis and erosive gastritis evidenced by endoscopy in marathon runners (Kwon & Lamont, 2013). Thalmann et al. showed in a study on 37 athletes participating in the ultramarathon that prophylactic pantoprazole administration (20 mg) prevents the development of digestive hemorrhage (Thalmann et al., 2006).

Intestinal ischemia

Intestinal ischemia is rarely found in athletes, but when it manifests, it frequently affects the terminal ileon, the ascending colon and the sigmoid colon. The appearance of stools with pathological products, particularly blood, along with nausea, vomiting and abdominal pain at least 24 hours after an endurance competition raises the suspicion of ischemic colitis (Peters et al., 2001; Kwon & Lamont, 2013).

The main factor responsible for the development of intestinal ischemia is the decrease of blood flow in mesenteric circulation. During intense physical exercise, blood is mainly directed towards the limb muscles, which may cause a decrease of mesenteric flow by up to 80%. The amount of blood redirected from the intestinal area determines various degrees of gastrointestinal ischemic impairment, from cramps to ischemic colitis (Peters et al., 2001; Kwon & Lamont, 2013; Sanchez, et al., 2006). In a study monitoring splanchnic hemodynamics in marathon runners before and after competition, a significant decrease in the diameter of the upper mesenteric artery and a decrease in the resistivity index by Doppler ultrasound were found (Kwon & Lamont, 2013).

If an ischemic complication is suspected, adequate hydration both before and after competition is recommended, as well as the reduction/interruption of the intensity and duration of training (Peters et al., 2001).

Gastrointestinal infections

Such infections rapidly spread through the air or water among athletes participating in team sports or in big competitions with many athletes (Kwon & Lamont, 2013).

Haywood et al. demonstrated that probiotics help increase immunity. The study was carried out on a rugby team and included two groups: a group treated with probiotics and a group receiving placebo. In the group treated with probiotics, a significant decrease of complaints caused by respiratory and gastrointestinal infections compared to the placebo group was found. The results of this study are supported by other studies, which demonstrated a decrease in the incidence of infectious diseases in athletes using prophylactic probiotics (Haywood et al., 2014).

Discussion

Gastrointestinal complaints frequently occur during heavy training, particularly during competitions such as the marathon or the running event as part of the triathlon. Symptoms more frequently manifest in young, inexperienced competitors and in the female sex. The most frequent gastrointestinal complaints are gastroesophageal reflux, nausea, vomiting, diarrhea, abdominal pain and digestive hemorrage (Thalmann et al., 2006; Peters et al., 2001; Sanchez, et al., 2006; Halvorsen et al., 2014). Sullivan et al. noted a positive correlation between the intensity of physical exercise and the severity of gastrointestinal disorders. An increased prevalence of gastrointestinal complaints was evidenced in marathon runners who ran the race at a higher speed than the rest of the marathon runners (Halvorsen et al., 2014). There is a wide range of digestive disorders in athletes, in close relationship with the intensity and the duration of physical exercise.

For athletes complaining of gastroesophageal reflux disease symptoms such as pyrosis, abdominal pain, it is recommended to change diet, to avoid food consumption

at least two-three hours before training or competition, and when symptoms persist, pharmacological treatment with proton pump inhibitors has proved to have good results (Peters et al., 1999). For diarrheal syndrome, the avoidance of fat-rich, hypercaloric, hyperglucidic foods and adequate hydration are recommended (Kwon & Lamont, 2013; Rao et al., 2004). The most frequent form of presentation of digestive hemorrhage is occult hemorrhage, which is usually transient. Studies have demonstrated that prophylactic treatment with proton pump inhibitors has a very good effect for prevention (Thalmann et al., 2006). The treatment of digestive disorders in athletes is usually minimal, the most beneficial measures refer to diet that precedes physical exercise.

Some researchers estimate that the appearance of gastrointestinal symptoms might have a protective effect on abdominal organs, their progressive nature causing the athlete to reduce the intensity and duration of training (Peters et al., 2001).

Conclusions

1. Digestive disorders in athletes are numerous, most frequently transient, closely related to the intensity and duration of physical exercise.

2. Changes related to diet (content, relation of the meal to the time of performance of physical exercise) are most frequently sufficient; drug treatment is rarely required.

Conflicts of interest

Nothing to declare.

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