TAKE NOTE OF ALTITUDE GASTROINTESTINAL BLEEDING

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In the October 1999 issue of the ISMM Newsletter, the case discussion is of importance in the understanding of gastrointestinal haemorrhage occurring at high altitude. It leads to some intriguing speculation about the effects of high altitude on the gastrointestinal mucosa, and particularly the cause of gastrointestinal bleeding (GIB).

The epidemiological and clinical studies suggest that GIB is not uncommon at high altitude. In Tibet, Lian TY and Hun XM (1) reported that from 1978 to 1984, a total of 4,520 labourers and 830 staff ascended to and worked at altitudes between 4767m and 5232m constructing and repairing the Qinghai-Tibetan Highway between May and October each year. The incidence of GIB in labourers and staff was 0.95% (43 cases) and 1.93% (16 cases), respectively. Among them, the onset of GIB in two cases were five and eight days after arrival at altitude, the rest were 10-70 days. In the Mt. Karakoram area, Liu MF (2) reported about patients at a Chinese Army Hospital located at the foot of Mt. Karakoram (3550m). The hospital took in sick soldiers who were from the lowlands and stationed between 3700m and 5380m for one year. GIB accounted for 0.8% of the total patients and 1.5% of AMS cases hospitalized during the same period.

As most mountain physicians know, although cardiac, respiratory and neurologic symptoms are more common among mountaineers, epigastric pain, dyspepsia, haematemesis, piles and peptic ulcer are also frequent features in them (3). Hu HC and Wu TY (4) pointed out that GIB may be manifested by, haematemesis, by melaena or by hematochezia. Bleeding, however, may be only occult, with normal-appearing stools which on chemical determination are shown to cotain blood. The occult blood in stool was examined by Naito H et al (5) during their Iwate Karakoram expedition. In 10 mountaineers, they used "OC-Hemodia Kit" which can detect only human hemoglobin without cross-reaction to any other animal's Hb. The results showed a positive reaction in two subjects associated with apparent gastric symptoms, the other five members responded with slightly positive results. These data suggested that silent GIB may occur at moderate altitude (3800m). Nevertheless, Saito A (6) reported five climbers who suffered from upper alimentary bleeding which occurred at extreme altitudes between 5154m and 8200m on Mt. Everest, all of them presented with tarry stool and acute anemia.

GIB give rise to many of the symptoms and signs which depend upon the rate and extent of bleeding. In general, an acute moderate bleeding (blood loss of greater than 500 to 1,000ml) results in drowsiness, dizziness, oliguria, sweating and pallor. Blood pressure changes occur first in the form of orthostatic hypotension. Pulse rate seems to be a far less accurate parameter, particularly at high altitude, as tachycardia is common amongst such mountaineers. The findings of a decreased BP, increased HR associated with epigastric pain, pallor, acute anemia and a positive reaction of the test for blood in stool support the diagnosis of GIB.

Recently, scientists performed a series of important studies using endoscopic examination among altitude residents and mountaineers. Sugie et al (7) reported the results of endoscopic examination at the Mt. Xixabangma BC (8020m). 22 mountaineers served as subjects (20 males and 2 females, mean age 32.2 yrs). Gastro-duodenal mucosal lesions were presented in 13 of the 22 subjects (59%). Among them, 3 had acute gastric mucosal lesion (AGML) (2 linear gastric ulcer and one bleeding gastritis), 2 duodenal ulcer and one gastric ulcer. Zhao GB and Li R (8) also performed an endoscopic examination with a mucosal biopsy among 51 young healthy male subjects (mean age 27 yrs). The subjects were Han Chinese lowlanders who had migrated to the Lhasa area at at 3658m to 4200m (Tibet) within the previous one week to one month. They found the incidence of gastro-duodenal mucosal lesions to be 60.8%. 27 had acute superficial gastritis, 3 had AGML and one had duodenal ulcer. Diffuse bleeding and erosion, and ulcerous necrosis were observed in the stomachs with AGML.

Endoscopic examination suggests that GIB at altitude is caused by gastro-duodenal ulcers and also bleeding gastritis and diffuse erosion of the gastric mucosa.

Surprisingly, one male mountaineer on a Mt. Everest Expedition developed a massive GIB and serious anemia at an altitude of 7028m, because his Hct decreased to 21%. He was sent back to Japan immediately, the endoscopy examination performed just after his arrival at sea level, showed no abnormality (6). Also, Zhou XD (9) reported the case of a health lowlander Han subject who developed a GIB during a sojourn at Lhasa (3658m). He died from a recurrent massive GIB, postmortem revealed only diffuse superficial erosion in the stomach with no evidence of peptic ulcers. Perhaps, it may be a specific form of AGML.

AGML is induced by some drugs. Relief of headache in AMS is, as David Syme suggested, a difficult matter because of the risk of analgesics like aspirin and other NSAID causing GIB. Dexamethasone has been used for the prevention and treatment of AMS (10,11), but caution is needed if the person has previously suffered from ulcer as dexamethasone may increase the risk of GIB.

Historically it was believed that use of alcohol could relieve and protected against AMS (Marcet, 1886-1888). However, it is now recognized that alcohol may be a risk factor of GIB at altitude. Steele (12) described three Sherpas presenting with severe epigastric pain, nausea and vomiting after strong drinks on Mt. Everest. He considered that they were suffering from acute peptic ulceration and had to be brought down. One Sherpa had a brisk haematemesis of about 1 liter, after a heavy drinking bout. As mentioned. it is probable that a relatively higher incidence of GIB in the staff on Mt. Tanggula may related to their drink hard (l).

High-altitude GIB can be life threatening and acute massive bleeding with the secondary effects of shock-increasing anoxia, cellular dysfunction and acidosis at high mountains may lead to death. The mortality reported by Liang TY (1) was 6.8%, four individuals died. Among 59, two died on the high mountain because they were in remote area and unable to descend. Two died because evacuation to a lower altitude was delayed. Descent is curative. 31 cases were transported from the

mountain to an altitude of 2800m, 24 cases were evacuated to 2260m, and hospitalized immediately for further evaluation and treatment, and their conditions gradually improved.

The mechanisms of altitude GIB remains obscure. Experimental studies suggested that AGML could be induced by cold stress (13) or hypoxic stress (14) in rats. However, on high mountains, the cold stress usually accompanies the effects of hypoxic stress in the same mountaineer. In this regard, hypoxemia is probably the main factor causing AGML in mountaineers who were otherwise healthy at sea level (7). Kamiyama et al (15) attributed a potential difference (PD) as a gastric mucosa defensive mechanism that may play an important role in the pathogenesis of hypoxia-induced AGML. The PD is closely related to transport of electrolytes by gastric mucosal cells which depend on aerobic metabolism. Hypoxemia might cause changes in tissue levels og oxygen resulting in decrease PD. Naito et al (16) noted that peroxidation of phosohatidylcholine in gastric mucosa is another possible mechanism for the development of AGML. Polycythemia is a common feature seen in mountaineers (8,9). AGML could be caused by microvascular thrombosis due to polycythemia (17).

The above factors could partly explain the higher incidence of gastric ulcers (18) and of bleeding from ulcers in high altitude residents who were chronically exposed to a hypoxic erivironment (19). Therefore, persons with known peptic ulceration should not go to altitude unless their symptoms have been well controlled with medication.

The emergency manoeuvre for an apparent altitude GIB is rapid descent, oxygen inhalation and saline-infusion or blood transfusion (if possible). Drugs, such as the H2 blockers (ranitidine etc) or proton pump inhibitors (e.g. omeperazole) has been shown to be effective in ameliorating GIB. Any mountaineer should know about symptomatic self care for GIB, that is, when the symptoms such as epigastric pain is present. An H2-receptor antagonist is effective for the ulcers and GIB and is the current recommended, therapy.

We also noted that approximately 64% of GIB occurred with AMS, and about 36% have altitude GIB along (4). Thus, whether altitude GIB is a form of mountain sickness or a complication of ascent to high altitude only? Further investigations are needed.

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