First test to predict acute mountain sickness

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The first test to identify acute mountain sickness has been developed by a team of researchers in Italy and France and is presented today at EuroEcho-Imaging 2013. The test could revolutionise trekking and climbing by predicting who will develop the potentially deadly condition so they can avoid high altitudes, ascend more gradually or take preventative medication.

EuroEcho-Imaging 2013 is the official annual meeting of the European Association of Cardiovascular Imaging (EACVI), a registered branch of the European Society of Cardiology (ESC). It takes place during 11-14 December in Istanbul, Turkey, at the Istanbul Lutfi Kırdar Convention & Exhibition Centre (ICEC).

Dr Rosa Maria Bruno, first author of the study, said: "It is well known that when ascending to high altitude the quantity of oxygen (O2) in the air becomes lower and lower. Thus people going to high altitude, above 2500m, develop hypoxia, which is a reduced content of O2 in the blood and tissues. The physiological response to hypoxia is however very different among individuals, ranging from successful adaptation to mild to severe symptoms, called acute mountain sickness (AMS)."

She added: "The symptoms of AMS (headache, nausea, dizziness, fatigue, loss of appetite, insomnia, irritability) occur in about 30% of people exposed to hypobaric hypoxia. Furthermore, 1-2% of people develop potentially life-threatening conditions, such as cerebral and pulmonary oedema."

Dr Bruno continued: "At the moment we don't know exactly why some people can adapt successfully to high altitude and other people cannot, or how to identify susceptible individuals in whom preventative strategies may be applied. This can be an important problem since an increasing number of people of all ages go to high altitude, mainly for recreational purposes but also for working (i.e. site for construction of cable cars), without being conscious of the potential risks. This is the reason why this study was planned."

The researchers hypothesised that cardiovascular maladaptation to hypoxia is responsible for AMS symptoms, thus its early identification could predict the future development of symptoms. They studied cardiovascular function by means of non-invasive, ultrasound-based techniques in 34 healthy volunteers at sea level and after passive ascent (by cable car) to 3842m (Aiguille du Midi, France). About 1/3 of the individuals had previously experienced an episode of high-altitude cerebral and/or pulmonary edema.

After 24 hours at 3842m, 13 out of 34 volunteers developed symptoms of moderate to severe AMS. Their cardiovascular function at sea level was similar to the remaining group.

But they had significant alterations in cardiovascular adaptation to hypoxia after only 4 hours from arrival at high altitude: their O2 saturation was significantly lower and the systolic function of the right ventricle, evaluated by means of cardiac ultrasound (tricuspid annular plane systolic excursion, TAPSE), decreased – all in the presence of a similar increase in pulmonary artery pressure compared to subjects without AMS symptoms. In contrast, TAPSE was unchanged in the individuals without AMS symptoms.

Dr Bruno said: "When analysed separately, none of these measures was sufficiently accurate to predict AMS. But when we combined O2

saturation and TAPSE, both very easily measurable, we found that a TAPSE value

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