
BEEN THERE DONE THAT

High altitude in South America!

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Introduction

Mountaineering has been a recognised adventurous training activity across all three Services for several years. Recent expeditions have included successful ascents of 8000m peaks such as Everest & Canchenchunga. The change in the political situation around the world has opened up regions previously 'off limits' for military expeditions, such as areas of the former Soviet Republic and South America.

Exercise *Andes Dragon* was a 2nd Battalion Royal Anglian Regiment expedition to Argentina, in March 2002. Since Argentina became accessible to the military it has become a popular destination for mountaineers. The aim of our trip was to climb Mt Aconcagua, the highest point in South America at 6972m. Mount Aconcagua is situated on the border with Chile in the heart of the Andes range, two hundred miles from the nearest hospital. The combination of high altitude, extreme heat and cold make it a challenging environment in which to operate.

I was invited to join the exercise as medical officer, by the trip leader Lt J P Downes. Lt Downes and I had previously been on expeditions together to Bolivia & Africa. When I was initially approached six months prior to departure, although enthusiastic, I was a little pessimistic about my chances of getting away from my hospital jobs! Fortunately my superiors were very supportive and I was granted the necessary leave.

Many climbing trips are organised each year and the majority manage without

professional medical support. However, all Army exercises to remote areas involving 'high risk' activities must now undergo a formal risk assessment. The high risk/remote board is conducted at divisional level and is designed to ensure that all precautions are taken to minimise the risk to participants. The presence of a doctor reassures the board and is sometimes deemed necessary in order to secure approval for the exercise. In our case the fact that I had been to high altitude several times before reassured the board and offset the fact that we had quite a few novices on the exercise. We were also very fortunate to secure two of the Army's premier Instructors for the trip.

Mountaineering High Altitude medicine is not a subject included in general medical education. This article will describe the basic provisions required to provide medical care to a high altitude expedition and from where to obtain further information. This is based on personal experience at high altitude and the current recommendations of the International Society of Mountain Medicine. The contents of an appropriate medical kit will also be considered.

Preparation

The basic preparations of vaccinations and ensuring medical fitness to participate go without saying. Information concerning the local area can be found from the usual sources including travel websites and post exercise reports. It is important to ensure that all participants are dentally fit, since unless one's dental skills are well practised

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such problems can be severely debilitating. The medical kit was compiled bearing in mind the remoteness of our location and the need for the equipment to be man-portable. The main concerns were, soft tissue injuries, wounds, burns, altitude illness, GI upset, cold weather injury and the unlikely event of severe trauma. The preparations were made more interesting with the revelation that one of the members of the expedition was asplenic. This required consultation with a senior occupational health physician, who advised me that as long as the areas being visited were not malarial and that certain precautions were taken, the soldier would be allowed to participate. The precautions were;

- The soldier drank bottled or purified water only.
- He continued with his prophylactic penicillin.
- IV antibiotics were available.
- The soldier was removed at the first sign of infection.

Altitude Considerations

The effects of altitude are felt due to the decrease in pressure as one ascends and the resultant decrease in PO_2 . The decrease in PaO_2 triggers an increase in ventilatory rate that results in a hypocapnic state. The respiratory alkalosis that occurs is slowly corrected over days by renal excretion of bicarbonate. If one ascends slowly then the body has a chance to acclimatise without severe symptoms. However, if the ascent is too fast or one is slow to acclimatise problems can occur. The mechanism for altitude illness is complicated and those interested can find out more by attending the courses and reading the books recommended below.

However, here follows a brief overview. There are three main conditions and these are best thought of as a spectrum, with Acute Mountain Sickness (AMS) at one end and High Altitude Pulmonary Oedema (HAPE) and High Altitude Cerebral Oedema (HACE) at the other.

The signs and symptoms of these conditions are listed below. The first treatment of all these problems is to descend quickly. However, sometimes this can be inhibited by poor weather conditions and concurrent injuries. A number of drugs have been proven to help in the treatment of these conditions and recommendations are given below.

Signs and Symptoms of AMS

Acute Mountain Sickness.

- Loss of appetite.
- Nausea or vomiting.
- Fatigue.
- Dizziness.
- Difficulty in sleeping.

HAPE

- Extreme fatigue.
- Breathlessness at rest.
- Fast shallow breathing.
- Chest tightness/congestion.
- Cyanosis.

HACE

- Confusion.
- Ataxia.
- Inability to walk in a straight line.

Treatment

AMS is treated by descent, Diamox 250mg bd and in extremis dexamethasone 4mg followed by a 2nd 4 mg 6 hrs later. HAPE once again mandates descent, with con-

sideration of nifedipine 20mg qds. HACE is managed with descent and dexamethasone 8mg stat & then 4mg qds.

Acclimatisation

Ascent should be slow, sleeping no higher than 300-500m above the previous night once over 3000m. If this rate is exceeded then a rest day should be taken. We operated a policy of climbing high and sleeping low, the ascent profile is given below. This involved ferrying kit to a higher camp then returning to the lower camp, followed by moving to the higher camp the next day. These became known as the dreaded 'load carries' (Table 1).

The drug Diamox (acetazolamide) has been proven to work as a chemoprophylactic in preventing the onset of altitude illness and speeding up acclimatisation. The use of the drug is contentious as some people consider it doping. The ISMM does not recommend its routine prophylactic use, reserving it for those with a history of acclimatisation problems or those forced to ascend quickly, such as in a rescue. If it is to be used, the ISMM advise a dose of 125-250mg to be taken bd, a day prior to ascent to altitude and continued until descent.

The draw back of Diamox is that it has side effects of paraesthesia in hands and feet, making carbonated drinks taste flat as well as a mild diuresis that settles over a few days. We used a dose of 125mg bd and the side effects were less, compared with a trip to Bolivia where I used a dose of 250mg bd. None of the expedition suffered severe altitude symptoms and in comparison with other groups we were the only party to have all members reach the top camp 3 at 5900m. Whether this was due to a slow ascent programme or the use of diamox is

difficult to quantify. However, our ascent profile was similar to other groups not taking diamox, which only succeeded in getting 40-60% of their members to camp 3. Anecdotely our instructors were using Diamox for the first time and reported feeling much better at altitude than on previous trips.

Table 1. Ascent Profile Climbing phase (heights listed to the right are sleeping altitudes).

Day 1	Arrived at Puente del Inca	2700m
Day 2	Walk in to Confluencia camp	3200m
Day 3	Acclimatisation day walk to 3800m minus pack then back.	3200m
Day 4	Walk to Base Camp	4250m
Day 5	Rest day	4250m
Day 6	Load carry to Camp 1(4930m) Then back to base camp.	4250m
Day 7	Move to camp 1	4930m
Day 8	Load carry to camp 2 (5400m)	4930m
Day 9	Move to camp 2	5400m
Day 10	Rest day	5400m
Day 11	Load carry camp 3 (5900m)	5400m
Day 12	Move to camp 3	5900m
Day 13	Summit day, down to base camp	4250m
Day 14	Pull out to civilisation	2700m

In country health provision.

The Argentines had set up small medical tents at base camps that also had access to the local helicopter service, on both sides of the mountain. The helicopter could fly up to camp 2 (5400m) but no further. The medical tent provided shelter, fluids and a defibrillator. All climbers had to book in for a compulsory pulse oximetry test. Those below 80% were not allowed to proceed higher until they were over 80%. We registered results from 93-85%. The presence of a pulse oximeter can be a





double-edged sword. Although it is a useful clinical tool, if used as a general gauge of acclimatisation the results can have profound psychological effects, with climbers convincing themselves that because they have low saturations they can't make the summit. Once over 3500m it is not uncommon to remain at saturations of less than 90% until descent.

The nearest hospital was in Mendoza, two hundred miles away by road. An insurance policy was taken out prior to departure to cover medical expenses and repatriation.

Clinical Cases.

Fortunately there were no serious cases requiring evacuation. There were several cases of GI upset, including one case of severe diarrhoea and vomiting that settled with antibiotics and antiemetics.

All personnel were equipped with plastic boots, an essential item higher up as the temperatures were -20°C . Two climbers from another trip presented to the base camp doctor with severe frostbite of their feet and had to be flown off the mountain. We also witnessed a case of snow blindness with the patient having to be led down the mountain from camp 2 at 5400m. This is a good reminder that UV exposure is greater at altitude than at sea level, and that precautions must be taken to protect the eyes and skin. Everyone on the trip suffered some skin loss from sunburn despite the extensive use of sun blocking creams. Although most commercial expedition companies are usually very professional we witnessed a few situations that raised questions over their selection procedures. A friend of mine leading a commercial trip had to send one climber back after he developed panic attacks on the walk in to

base camp. Another member of the same group lost his nerve when he reached the snowline as he had never been on snow before.

Discussion

The worst case scenario in such a remote location has to be a multiply injured trauma patient. A balance has to be struck between providing effective care and packing an entire A&E department. I have suggested a possible expedition medical kit list below (Table 2). I also believe that on these trips it is important that all the participants are aware of the limitations of the medical attendant and of the equipment which is being carried. Non-medical personnel can have very unrealistic perceptions of one's abilities in such environments.

I would suggest that anyone planning to accompany an expedition should have some experience of primary and pre-hospital care. It would also be advisable to find out some more about altitude medicine. The 'High Altitude Medicine Handbook' by Pollard & Murdoch is an easy read and very informative. The ISMM website can be found at ismmed.org. There is also a biannual altitude medicine course run at the national mountain centre at Plas-y-Brenin in Wales. Alternatively, there are quite a few doctors within the Corps with some experience and contact details can be obtained from the author.

Conclusion

Ex Andes Dragon was a thoroughly enjoyable trip and well worth doing! I would also like to highlight South America as a great place to gain high altitude experience. There are several countries sporting many peaks over 6000m such as Equador, Peru,

Table 2. High altitude expedition medical kit list.

Analgesia Paracetamol 500mg x 40 Cocodamol x 20 Voltarol 50 mg x 30 Lignocaine 1% x 1(50ml) Naloxone IV 400mcg x 6 Nubain IV 20mg x 5 Maxalon IV/IM 10mg x 5	Antibiotics Amoxil 500mg x 75 Flucloxacillin 500mg x 75 Erythromycin 500mg x 75 Ciprofloxacin 200mg x 100 Metronidazole 500mg x 75 Daktarin Cream x 2 Cefuroxime 1g IV x 2
Altitude drugs Diamox 250mg x 150 Dexamethasone 4mg x 20 oral and injectable Nifedipine SR 10mg x 20	
Allergy/Anaphylaxis Ventalin Inhaler x 1 Clarityn x 10 Prednisolone 10mg x 30 Adrenaline IM 1mg 1 in 1000 x2 Piriton IV 10mg x2 Hydrocortisone IV100mg x2	Gastrointestinal Rehydration sachets x 10 Loperamide 2mg x 30 Losec 20mg x 10 Buscopan 10mg x 10 Anusol x 1
Creams Flamazine cream x 1 Bonjela x 1 Eurax Cream x2	ENT/Ophthalmology Fluorescein drops x 1 Amethocaine eye drops x 1 Chloramphenicol oint x 2 Throat lozenges x 30 Otrivine x 1
Trauma Guedel x2 Nasopharyngeal airway size 6 x 2 Aquagel sachets x 2 Neck collar select x1 Portex Chest drain x 1 Green canulae x 5 First field dressing x 5 SAM splint x 2 Triangular Bandage x 3 Diazemuls IV 10mg x2 Green needle x 10 Orange needle x 5 Saline for injections 10ml x 10	Minor injuries Tubigrip C x1 Tubigrip D x1 Strapping tape x1 Gauze x 1 roll Non adherent dressing x 2 Elastoplast roll x 1
Diagnostics Thermometer x1 Stethoscope x 1 Sphygmomanometer x 1 Pulse Oximeter x 1 Blue light x 1	Surgical Scalpel blade 15 Syringes 5ml x 10 Betadine bottle x 1 Suture pack with instruments x1 Steristrips x 3 packs

Bolivia & Chile. The people are very friendly, even if you do turn up on the 20 year anniversary of your last war with them! The peaks aren't as crowded as Europe and the cost of living out there is very cheap. The season for Aconcagua is December to March, outside these dates the rivers which must be crossed to reach base camp are often impassable.

For all those out there with a similar interest, these trips are always crying out for doctors. Those who are interested should consider joining the Army Mountaineering Association. For more details log onto their website - theama.org.