Expedition Medical Care — Army China Expedition 1981

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SUMMARY: The planning and execution of medical care is described for a nine-man mountaineering expedition to China.

Fig. 1 Mount Jiazi, Sichuan Province

Introduction

The nine-man British Army China Expedition (1981) was led by Maj (now Lt Col) M W H Day, RE, to climb Jiazi Peak (6,540m) in Sichuan Province (Fig. 1), close to the Tibetan Border, and spent seven weeks above Base Camp at 3,900m in tented accommodation.

Administrative arrangements were made through the Chinese Mountaineering Association (CMA), who provided for transport to the roadhead and four accompanying Chinese personnel.

Prior to the expedition, the last foreigners in the Jiazi area were members of the American Sikong Expedition of 1932. The British expedition had only one photograph and two water-colour sketches of Jiazi prior to departure, knowledge of the local area being scanty. The expedition fell into two phases—

(a) Four weeks spent exploring the glaciers surrounding Jiazi, including several excursions of small parties. During this phase the first ascent of Tchiburongi (5,800m) was achieved.

(b) Three weeks devoted (unsuccessfully) to the

summit assault, including four attempts and much strenuous and technical climbing in which all members of the expedition were involved.

Conditions varied from a humid heat during reconnaissance to winds and severe sub-zero temperatures on the mountain. Each member climbed a total of the order of 30,000m in seven weeks.

Planning

Knowledge of the area and back-up facilities were such that it was necessary to plan for routine care and total care of possible casualties during a week's evacuation to Hong Kong, using local transport facilities.

Anticipated problems related to the expected very short march-in to Base Camp in relation to acclimatisation, and also the likely splitting of the expedition during the reconnaissance phase. Planning was based on personal clinical experience, relevant text, past expedition reports, research papers, and personal advice. Fig. 2 outlines the main areas of consideration.

The scale of the expedition did not permit the scheduling of medical equipment to cope with problems presented by local inhabitants, which in any case were very few, due to a short march-in, a comprehensive, though basic primary care service and a low profile maintained when such demands

Fig. 2 Main areas of consideration

were likely. It is not known what the official Chinese reaction would be to a western expedition's "hearts and minds" campaign, but it would be unlikely to be favourable. The morality of such care offered to local people has rightly been questioned in the past¹. In keeping with the observations of the Kongur expedition², coincidentally in China at the same time, a good basic standard of health was evident, though eye disease was common. A satisfactorily equipped hospital existed at Kang Ding (Tatsien-Lu), 20Km from the expedition roadhead. Major centres have hospitals using western techniques and those in Peking (Beijing) and Canton (Guangzhou) accept foreigners and have clinics for them.

Prophylaxis

Prior to departure, the expedition members were widely dispersed in Germany and England and personal preparations were made with the aid of each member's Unit Medical Officer. These included a history, perusal of military medical records, physical examination, blood screening, chest radiography (if not performed within the last year), and electrocardiography.

Specific enquiry in the medical history was made with reference to blood grouping, previous experience at altitude and problems encountered, surgical history, drug history and allergy. As a result, several relevant points of history emerged which affected the choice of medical equipment, notably of an unproven duodenal ulcer, a Potts fracture within a year of departure of the expedition, frostbite of fingers with tissue loss sustained in the Himalayas in 1980 (previously reported), a recent whiplash injury, and a severe allergy to fish.

Electrocardiography of one member, aged 25, showed S-T elevation in leads I, II, AVF, V4 and V6 of a type normally associated with pericarditis, and T inversion in V2. Voltage criteria were compatible with left ventricular hypertrophy. Subsequently, on exercise, S-T elevation improved, although bizarre changes were noted in the T wave of V4. These changes were eventually regarded, after specialist advice, as being normal variants, accounted for by the member's extreme fitness. Mitral leaflet prolapse was diagnosed in a second member, on clinical and electrocardiographic grounds after specialist intervention, but the opportunity was not available to confirm the diagnosis on echocardiography.

Some authorities would regard this degree of medical preparation excessive, especially for serving soldiers whose medical screening is in any case regular. However, the returns in this series of examinations justified the preparation.

One member was treated by cautery for recurrent

nosebleeds before departure. All members had a thorough dental check and necessary treatment before departure.

All members were brought up to date with inoculations against paratyphoid A and B, tetanus, polio, diphtheria, cholera and tuberculosis. Within one month of departure all members received immunoglobulin as prophylaxis against infectious hepatitis. Maloprim (primethamine and dapsone) was advised for prophylaxis against malaria³, and taken throughout the expedition, though constant reminders were necessary. Prophylaxis against plague and typhus were not considered necessary.

Not surprisingly, it was not possible to exercise the same degree of scrutiny or control over any preparations for our accompanying CMA personnel.

All personnel were trained to the standard level of Army first aid, and, in addition, one member held the standard St John Ambulance Certificate, and one trained as a medical orderly. The latter was "volunteered" as the orderly in the absence of the doctor.

Hygiene, especially with regard to drinking water, is particularly important on most expeditions⁴, and diarrhoea is a common complaint on many. Our very short march-in prevented this problem to a large extent, and at base camp fresh spring water was available and used without treatment. This was upstream of the local Tibetan yak herders' "fridge" where a yak carcase was preserved in the brook! Above base camp snow was melted. Sanitation was by the "cat" method—the only method permitted by the ground.

A satisfactory diet is undoubtedly of considerable importance, particularly to expedition morale⁴. The specially prepared modified "Compo" rations with dehydrated additions provided a very palatable high calorie (6,000 KCal) diet, which was supplemented by local purchases of eggs and potatoes at base camp. Comprehensive "brew packs" helped maintain the interest in the necessary fluid intake. (An intake of 3-4 litres has been noted at altitudes in excess of 5,000m, and fluid loss at altitude is increased due to increased respiratory loss and despite urinary retention⁵).

Casualty Evacuation

Prior arrangements for possible casualty evacuation were not possible due to the lack of information before arrival at our roadhead. A stretcher could not be taken due to limitations on the size of freight articles. Transport by pony or yak would have been possible from perhaps 300m above base camp to the roadhead, and thence to hospital at Kang Ding, if necessary. Evacuation out of China would have required the use of standard transport facilities.

theory, it might have been possible to bring in a helicopter hired from Hong Kong, but the expense would have been considerable. We fortunately had communications of a high standard which aided medical care on the mountain.

Medical Problems Encountered on the Mountain

Medical problems expected to be encountered on a high altitude expedition can broadly be expected to be related to hypoxia, cold, ultra-violet light, infection, injury and other miscellaneous factors. A great deal of interest exists at present concerning acclimatisation to altitude, and acute mountain sickness, together with its serious variants High Altitude Pulmonary Oedema (HAPO) and High Altitude Cerebral Oedema (HACO) and these topics are extensively reviewed.^{4,5,6} The role of drugs, notably Acetazolamide, in prevention of acute mountain sickness has been discussed^{5,6,7} but observations of its efficacy in this situation vary and it is accepted that it is no substitute for acclimatisation. It was not used on this expedition.

All members expectedly suffered headache, lassitude and anorexia to varying degrees on arrival at base camp (3,900m) which was reached in one day's march from the roadhead (at 3,000m). This rate of ascent is much greater than most authorities would recommend. Except for two members, all symptoms settled within two days. One member required descent to alleviate symptoms which had not responded to treatment for three days. Within 400m of descent he was symptom-free, and after a night's rest at the roadhead was able to return. He subsequently acclimatised well at higher levels and climbed very strongly. Loss of acclimatisation was exhibited by two members following a reconnaissance, having previously acclimatised well. All members lost weight initially, for some this loss was sustained, in two cases markedly so. Other features were observed, notably Cheyne-Stokes snoring, nose-bleeds, proteinuria and haematuria. Retinal haemorrhages have been noted and reported at altitude⁸, and also proteinuria and haematuria^{9, 10}. It is likely that exposure to high altitude predisposes to multiple microvascular lesions, of which these factors may be a reflection.

An unexpected event was a grand mal convulsion suffered by one member following a lengthy spell of cooking on a propane-butane stove in an inadequately ventilated tent at 5,300m. He recovered spontaneously when ventilation was improved, and subsequently convalesced after descent.

Some medical authorities would forbid attendance on an expedition by a previously frostbitten member. This in many cases is not realistic. On Jiazi previous injury was not worsened, and new frostbite did not

occur. Frostnip of toes occurred in three cases following the stamping of steps in deep powder snow.

Continuous daytime protection to the face and lips was required against intense ultra-violet radiation. All members suffered sunburn at some time, but high factor Delial preparations, together with lip salve, provided the best protection.

Several minor injuries were dealt with, and one member sustained an injury to his right thigh, with abrasions and considerable haematoma formation. Minor elbow and chest injuries were sustained at the same time. The leg wounds were treated initially with strapping, dressings and analgesia. Broad spectrum antibiotic therapy was started on the second day to treat a wound infection. Prophylactic antibiotics may well be justified under such circumstances as it is well recognised that wound-healing is delayed and wound infection common. (Prophylactic use of anti-biotics has also been recommended in the initial treatment of frostbite^{11,12}). It is a measure of this members' resilience that he made his way down the mountain unaided and with a full load. He was treated with benefit with ultrasound and physiotherapy on return to Hong Kong.

Diarrhoea bothered all members on the return except one (who had taken prophylactic Lomotil). These cases were precipitated by vast quantities of local food on our departure from the mountain. All responded rapidly to Lomotil (diphenoxylate and atropine) or loperamide. Two members required hospital admission in Hong Kong and England respectively for amoebic dysentery on return. These cases were probably contracted on the homeward journeys.

A variety of miscellaneous conditions also required attention. One of the seconded Chinese required dental extraction, which was performed on our initial arrival at the roadhead. He had a history of duodenal ulceration and subsequently had to be evacuated from base camp to the Kang Ding hospital following haematemesis which was probably precipitated by alcohol. Two members required treatment for haemorrhoids and one for a brief episode of angio-neurotic oedema. Sore throats and cold sores were common and were treated symptomatically.

Hypochondria undoubtedly existed and one member volunteered freely that he complained on occasions only because "You are here to complain to

Medical Equipment

Several limiting factors govern the choice of expedition medical equipment. Of fundamental consideration are the scope of the expedition, the expected treatment or not of local patients and the expected evacuation procedure and back-up in the

event of an emergency¹³. Weight and volume were also considerations to be borne in mind in this case, though not to such an extent as to have to consider the use of an ice screw to cut cranial burr holes as was contemplated by another expedition at the same time! Availability of supplies is also a limiting factor. It is clearly important that the equipment taken should be relevant to the skills and experience of the practitioner.

Personal packs were prepared (all equipment is listed at the end of this report), the doctor's being slightly more comprehensive, and stock equipment at base camp, packed as far as possible in sealed plastic boxes, the contents list visible through the transparent lid. Written instructions were left, together with relevant details, for use of equipment in the absence of the doctor. Potentially dangerous items were listed "For Doctor's Use Only."

Oxygen equipment was taken for medical purposes. This consisted of two 800 litre spheres and one administration set with a diluter-demand valve. This equipment was used for climbing on the Army Everest Expedition, and is described elsewhere.¹⁴ It permitted the administration of supplementary oxygen if necessary, but did not permit artificial ventilation. It was not used.

A supply of "Comforcast" splint material was kindly provided by Lt Col J T Coull, RAMC, Consultant Orthopaedic Surgeon, Queen Elizabeth Military Hospital. It is a lightweight glass fibre mat bandage, suspended in fluorocarbons and acetone, and sets spontaneously to become hard and waterproof on withdrawal from the sealed airtight container. Although the setting is temperature-dependent, the use of this type of material has major advantages in an expedition situation over conventional splinting methods. Plaster of Paris is unsatisfactory in freezing conditions, and inflatable splints are cumbersome and may have the damaging effect, when used in cold conditions, of further restricting peripheral circulation. Regrettably, Ayerst International Inc have ceased production of Comforcast, but other splintage methods offering advantages for expedition use are available.

Those seeking to cross international boundaries with medical equipment should check the local regulations.

Equipment was provided from stocks at military hospitals in Germany.

Discussion

Far more time and industry is expended in the planning of medical care for an expedition than in care of problems during the expedition.

Careful scrutiny of members' health in advance is undoubtedly of value, and time spent on the

planning and careful packing of equipment is not wasted. With the benefit of hindsight, the author would have taken rather less of most items, and would not have taken oxygen apparatus, despite the recommendation that it should be available to all those climbing to a height in excess of 15,000 feet¹⁵. The problem of air portability of pressurised oxygen, together with the fact that it is unlikely that the facility can be available where required on the mountain, justifies in the author's view, on this expedition, the reliance to be placed on intra-venous frusemide and rapid descent as the treatment for HAPO and severe acute mountain sickness.

The over-riding consideration for equipment in any expedition will not be the size or aims of the expedition, but the limits on weight and volume placed by the logistics of the expedition and cost.

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Personal Medical Pack

Field Dressing	x 1
Elastic self-adhesive bandage 7.5cm x 4.5cm	x 1
Melolin dressing	x 1
Airstrip	x 4
Safety pins	x 2
Tineafax powder	x 1
Dequadin Lozenges	x 20
Morphine syrette	x 1
Lomotil	x 20
flurazepam 15 mg	x 10
codeine phosphate 30mg	x 20
naftidrofuryl oxalate 100mg	x 10
Uvistat	x 1
Maloprim	x 6
Eye pad	x 1
Amethocaine Minims 1% 0.5ml	x 1
Lip salve	x 1
Algipan tube	x 1

Doctor's "Ready Pack"

As for personal medical pack, plus:—

Guedel airway	x 1
Scalpel	x 1
Artery forceps pair	x 1
Adrenaline 1/1000 1ml	x 3 vials
20mg papavaretum	x 5 vials
40mg frusemide	x 5 vials
Open woven bandages	Various
Stethoscope	
Syringes, needles, wipes	

SCHEDULE OF DRUGS

Gastro-Intestinal

Asilone Tabs	x 60
Hyoscine butylbromide	20mg Tabs x 60
prochlorperazine	5mg Tabs x 60
Cimetidine	200mg Tabs x 500
Lomotil	Tabs x 600
loperamide	2mg Caps x 60
codeine phosphate	30mg Tabs x 500
bisacodyl	5mg Tabs x 60
glycerol supps	x 30
Anusol supps	x 60
cinchocaine hydrochloride 1, 1%	30gm tubes x 4

Cardiovascular

frusemide	20mg Tabs x 50
glyceryl trinitrate	300mg Tabs x 20
naftidrofuryl oxalate	100mg Tabs x 50

Respiratory System

Dequadin Lozenges	x 1600
Bradosol Lozenges	x 240
salbutamol	2mg Tabs x 50
xylometazoline hydrochloride 0.1%	14ml x 4

Central Nervous System

flurazepam	15mg Caps x 250
diazepam	5mg Tabs x 50
aspirin soluble	300mg Tabs x 300
paracetamol	500mg Tabs x 200
dihydrocodeine tartrate	30mg Tabs x 60

Infectious

penicillin V	250mg x 100
ampicillin	250mg x 300
oxytetracycline	250mg x 60
erythromycin	250mg x 60
co-trimoxazole	480mg x 60
metronidazole	400mg x 60
Pripsen sachets	x 20

Eye Preparations

chloramphenicol drops 0.5% 5mls x 2
chloramphenicol ointment 1% 4g x 20
amethocaine hydrochloride 1% 0.5ml x 40
fluorescein sodium 1% 0.5ml x 8

Skin Preparations

benzyl benzoate	500ml
insect repellent gel	tubes x 6
zinc and castor oil	250g
Uvistat	tubes x 24
Mycota powder	25gm x 2
tolnaftate 1% 15g	x 3
hydrocortisone 1% mg	15g x 4
hydrocortisone 1% with vioform	15g x 4
fuicidic acid 2%	10g x 3

Anaesthesia

lignocaine 1% 250ml
bupivocaine 0.5% 100ml
ketamine 100mg x 4
cocaine 10% 5ml x 1
atropine 0.4mg x 4
naloxone 0.4mg x 4
naloxone hydrochloride 400mg x 2

Miscellaneous

chlorpheniramine 4 mg	x 120
lip salve	x 20

Injectable

prochlorperazine 12.5mg x 10

adrenaline 1/1000 1ml x 4
frusemide 40mg x 10
naftidrofuryl oxalate x 4

aminophylline 250mg x 4

Injectable

diazepam 10mg x 10
chlorpromazine 50mg x 10
pentazocine 30mg x 10
morphine syrettes x 10
pethidine 100mg x 6
papavaretum 20mg x 10

benzylpenicillin 600mg x 4
cloxacillin 250mg x 4
Triplopen x 4
erythromycin 50mgs x 4

Injectable

dexamethazone 4mg x 16
chlorpheniramine 10mg x 4
water for injection 5ml x 10

MEDICAL EQUIPMENT LIST

Diagnostic/Administrative

Record cards	x 20
Sphygmomanometer	x 1
Thermometer (low reading)	x 2
Diagnostic set	x 1
Labstix	x 1 bottle
Universal container	x 20

Oxygen/Resuscitation

Oxygen spheres 800 litres	
with diluter demand system	x 2
Ambu-bag set	x 1
Laryngoscope	x 1
ET tube	x 1
Mucus extractor	x 2
Hartmann's solution	2 litres
IV infusion set	x 2
Medicuts	x 4
"Butterflies"	x 10

Instruments

Suture packs	x 2
Minor ops pack	x 1
Dental set	x 1
Burr hole set	x 1

Dressings

Assorted Jelonet	x 30
Assorted Melolin	x 30
Gauze swabs	x 100
Ribbon gauze $\frac{1}{2}$ "	x 4
Eye pads	x 12
Cotton wool roll	x 2
Assorted open woven bandages	x 20
Elastoplast "airstrip" dressings	x 150
Elastic adhesive bandage 7.5 cm x 4.5 m	x 20
Assorted tape	
Roehampton burns dress	x 2
Field dressing	x 12
Assorted Velband	x 10
Triangular bandage	x 10
Zimmer splints	x 2
Kramer wire splints	x 2
6" POP roll	x 5
4" POP roll	x 5
Assorted crepe bandage	x 30
Assorted Tubigrip	
"Comforcast" splint packs	x 12
Inflatable splints	x 2
Cervical collar	x 1

Sundry Equipment

Dispogloves	x 20
Surgical gloves	x 10
Self-sealing dispensing bags	x 50
Disposable scalpels	x 10
Chest drain & Heimlich valve	x 1
Foley catheter 18 FG, bag, spigot	x 1
Silver nitrate caustic stick	x 1
Antiseptic wipes	x 100
Assorted syringes	x 50
Assorted needles	x 50
Assorted suture materials	
Dental paste, oil of cloves	
Millbank bag	x 1
Puritabs	x 200
Iodine solution	250 mls
Savlon concentrate	500 mls
K Y Jelly	x 2

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