Army Field Surgical Experience

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Summary: In the recent Falklands campaign four Army Field Surgical Teams were deployed in the two phases of the war. They functioned as Advanced Surgical Centres and operated on 233 casualties. There were 3 deaths. The patterns of wounding and the methods of casualty management are discussed and compared with other recent campaigns.

Introduction

During the recent conflict a Naval task force which included a land forces element, consisting of 3 Commando Brigade and 5 Infantry Brigade was dispatched to the South Atlantic. The initial landing of these units on East Falkland took place on 21st May 1982. Support for the land forces provided by the Army Medical Services consisted of:

1. A Regimental Officer (RMO) assigned to each major unit. At a later stage some units were assigned a second Medical Officer.
2. 16 Field Ambulance RAMC providing second line medical support for the land force.
3. Surgical teams drawn from 16 Field Ambulance (Parachute Clearing Troop) and 2 Field Hospital RAMC.

Additional support was given by a Royal Navy Ship's Surgical Team of the Marine Commando Medical Squadron whose experience will be reported separately.

A Task Force of this magnitude has not been deployed since World War II. The conflict took place at a distance from base of 8,000 miles, and with such long lines of communication and a relative lack of surface transport, obvious difficulties with re-supply of medical stores and rearward evacuation of casualties to base hospitals was envisaged. The medical support, therefore, had to be self sufficient to a degree not previously experienced.

Four Army surgical teams were deployed during this period. They had to work under hostile conditions, often very close to the battlefield, and were bombed by the Argentinian Airforce on a number of occasions.

The lack of suitable buildings, the virtual absence of roads, the often impassable terrain, and the appaling weather conditions, all influenced the collection, treatment and evacuation of casualties. These features also influence the surgical management of the wounded.

The Campaign

From the surgical point of view the campaign can be regarded as having occurred in two phases.

Phase One

On the morning of 21st May 1982 a number of beach-heads were established on East Falkland in the area of Port San Carlos, San Carlos and Ajax Bay (Fig 1).

Marine Commandos and Paratroopers were landed, largely unopposed. Field Surgical support for these units was provided by the two Field Surgical Teams of the Parachute Clearing Troop of 16 Field Ambulance, and a Royal Navy Ship's Surgical Team (SST) drawn from the Commando Medical Squadron.

An Advanced Surgical Centre was established in a disused refrigeration plant in Ajax Bay, and dealt with casualties resulting from the landings and the subsequent bombings of ships in the Falkland Sound and San Carlos Water. In addition, the wounded, following the celebrated battle for Darwin and Goose Green by the 2nd Battalion the Parachute Regiment, were treated at this Centre during 28th and 29th May.

Phase Two

With the arrival and deployment of 5 Infantry Brigade over the period 31st May – 2nd June, preparations were made for the next major land battles and the final assault on Port Stanley. Two Army Field Surgical Teams designated FST 1 and 2, and a Holding Section – vide infra – drawn from their parent unit 2 Field Hospital in Great Britain, in company with 16 Field Ambulance, provided the Brigade medical support and were to reinforce the Parachute Field Surgical Teams designated FST 5 and 6, and the Royal Navy Surgical Support Team on land.

As plans were drawn up for battles to take the horse-shoe shaped perimeter of mountains surrounding Port Stanley, Field Surgical Teams 1 and 2, their Holding Sections and 16 Field Ambulance less their advance party, were embarked on Royal Fleet Auxillary *Sir Galahad* in company with the Welsh Guards.

The object was to set-up a more proximal Advanced Surgical Centre (ASC) at Fitzroy Settlement from which the enemy had withdrawn (Fig. 2). In addition, FST 5 was moved to Teal Inlet and FST 6 remained at Ajax Bay. However, events altered the planning. With only elements of FST 1 ashore, Royal Fleet Auxillary Sir Galahad was bombed with the loss of all surgical equipment. Both teams were re-supplied with a variety of medical equipment gathered from the supporting fleet. FST 1 was then sent back to Fitzroy with FST 6 forming a two table A.S.C. as originally planned. FST 2 having survived the bombing was established in the refrigeration plant at Ajax Bay, alongside the Royal Navy Surgical Team which remained static.

The final deployment of the Field Surgical Teams is illustrated in Fig 2.

Field Surgical Teams

Field Surgical Teams (FSTs) are essentially highly mobile units capable of working independently in small groups. They can be rapidly deployed and become operational within 15 minutes of arriving at a location, subject to basic facilities being available, e.g. buildings, tentage, water, heat and light.

Each team consists of a surgeon, anaesthetist, resuscitation officer, four operating theatre technicians, a blood transfusion technician and a clerk(1).

The four Army Surgical Teams were organised as shown in Table 1.

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Fig 1 Map of East Falkland

Fig 2 Deployment of Field Surgical Teams on East Falkland

From PCT of 16 Field Ambulance	FST 5	Surgical registrar (CGB) Consultant anaesthetist General duties medical officer
	FST 6	Consultant surgeon (WSP McG) Anaesthetic registrar General duties medical officer
From 2 Field Ambulance	FST 1	Senior surgical registrar (DSJ) Anaesthetic registrar Dentist with resuscitation training
	FST 2	Senior surgical registrar (JR) Anaesthetic registrar Dentist with resuscitation training

Table 1. Organisation of Army Surgical Teams

Region	Number of Cases	Percentage
Head and Neck	36	14
Chest	18	7
Abdomen and pelvis	30	11.5
Upper limb	68	26.5
Lower limb	106	41

Table 2. Analysis of injuries treated by operation

Missile	Number of Cases	Percentage
Bullet	74	31.8
Fragment	105	45
Mine	25	10.8
***Unclassified**	29	12.4

Table 3. Wounding agents
**Unclassified: includes secondary missiles, road traffic accidents, sidewinder missile.*

Priority One	Priority Two	Priority Three
Require immediate resuscitation and/or immediate surgery	Require resuscitation and early surgery	Require no resuscitation and delayed surgery

Table 4. Priority of treatment

Holding Section

Nursing and postoperative care were provided by holding sections consisting of trained male nurses and medical assistants, either from 16 Field Ambulance or 2 Field Hospital.

Pattern of wounding

We comment only on patients operated on on land by Army surgical teams. Two hundred and ten cases underwent surgery by the four teams during the campaign. In addition FST 2 and FST 5 both utilised the civilian hospital in Port Stanley after the ceasefire, and operated on a further 23 cases. These included neglected war wounds, mainly Argentinian, and sadly a considerable number of patients, Service and Civilian, injured by unstable ordnance, unchartered mines and booby-traps.

Several casualties were injured by the accidental discharge of weapons which included the misfiring of a sidewinder air-to-air missile onto a group of soldiers on the airfield at Port Stanley on 13th July 1982. Table 2 gives a breakdown by region of the surgical operations performed by the four teams. The figures do not include the many patients who passed through the units with a variety of conditions requiring treatment but no immediate surgery. These also included several types of cold injury (immersion foot, trench foot, and frost bite), a variety of medical problems and more significantly numerous burns cases, resuscitated before evacuation to the Burns Unit on *SS Uganda*. FST 1 and 2 and 16 Field Ambulance, as has already been mentioned, were involved with the immediate resuscitation of more than fifty burns cases resulting from the bombing at Bluff Cove.

Table 3 provides an analysis of the wounding agents and the breakdown is as expected and correlates well with the results from more recent conventional wars (2-6). This analysis is quite unlike those reported from Northern Ireland where bullets cause a higher percentage of the wounds (7).

Casualty Management

The vast majority of casualties were received by helicopters as the only effective method of transport(5-8). It is worth noting, however, that particularly after the Bluff Cove bombing, many casualties walked considerable distances.

The mobility of Advanced Surgical Centres precludes a large holding capacity. Thus to avoid being overwhelmed with cases the ASC's in the Falklands dealt mainly with the most severely injured. These priority One and Two Cases (Table 4) were immediately resuscitated, operated upon and quickly evacuated rearward, often within hours of surgery, by air onto the hospital ship *SS Uganda* which functioned in this case as a general hospital.

The majority of wounds were caused by high velocity missiles. All wounds, therefore, were presumed to be heavily contaminated as a result of the cavitation effect of the wounding agent(9). Treatment was by accepted surgical techniques(1).

On arrival at a centre patients were resuscitated using a variety of intravenous fluids, Hartmann's, plasma expanders and whole blood. The airway was secured, endotracheal intubation being carried out if necessary. Tetanus toxoid booster and benzyl penicillin were given to all except cases of known hypersensitivity to the penicillin group of drugs. In addition, head wounds received sulphadimidine, and patients with abdominal and pelvic wounds were given metronidazole and either ampicillin or a cephalosporin.

An operating list was compiled by the resuscitating officer, anaesthetist and surgeon working together, though each of the casualties was continuously reassessed in accordance with the dynamic nature of the triage system, leading to frequent alterations of the list, depending on their changing clinical conditions(1). The response of each casualty to resuscitation was carefully monitored, and on occasions, in cases of severe multiple injury, immediate surgery was used as part of the resuscitative procedure.

In cases of limb injuries, entry and exit wounds were incised along the axis of the limb. Wide fasciotomy was practised, often including muscle compartments not seen to be involved. Skin was preserved as far as possible but subcutaneous tissues and dead muscle were widely excised, until the latter demonstrated healthy bleeding and contractility. Comminuted fractures were treated by lavage, removal of detached small fragments, approximate reduction and maintenance of bone length, and external POP splinting over well padded loose dressings.

Damaged tendons and nerves were marked wherever possible by silk sutures for secondary repair. Only important arteries and veins were repaired or vein patched (femoral, popliteal, brachial). Limbs beyond salvage were immediately amputated at the lowest possible level through healthy and uninjured tissues. Skin flaps were left long and bone ends covered by myoplastic flaps loosely approximated. A guillotine method was used when time was short. All wounds were loosely dressed and left open for delayed primary closure on the hospital ship (3,9).

Abdominal and pelvic penetrating wounds were all explored and presented major clinical problems; however, a number of abdominal wounds were tangential and did not enter the abdominal cavity. These patients did not have laparotomies at the advanced surgical centres, but were evacuated rearward with the knowledge that some might well come to laparotomy by virtue of the indirect injury to abdominal contents which may be caused by high velocity missiles (4).

At laparotomy a long mid-line incision was employed for wide access and arrest of haemorrhage was the immediate priority. With injuries to the small bowel it was common to find multiple perforations and lacerations caused by a single missile, in addition to severe mesenteric haemorrhage (4,9). Small bowel perforations were dealt with by marginal excision and closure or by segmental resection and end to end anastomosis. Colonic injuries which reached the Advanced Surgical Centres were few in number. Those of the right colon were treated either by marginal excision with simple closure or hemicolectomy and anastomosis. Wounds of the left colon usually involved bowel resection and a colostomy with mucus fistula, or repair with proximal colostomy, combined with generous drainage, or exteriorization of the injured segment.

Liver wounds were inevitably low velocity (3,9). One case of hepatic injury was treated by wound excision, laparotomy, marginal liver resection and haemostatic repair with drainage. The biliary tree was repaired and ducts splinted with drainage.

Chest injuries presented few problems. Patients with chest wounds were largely self selecting (4). No patients with mediastinal involvement reached surgical help alive in this series. Most of the wounds were peripheral or tangential, and because of the lungs' peculiar resistance to the cavitational effect of high velocity missiles did not require formal thoracotomy (3,9). Excision of the wounds along conventional lines, followed by tube drainage, was the standard treatment. Only 6 thoracotomies were carried out and these in cases of persistent haemorrhage and massive pulmonary injury. Also 1 of our chest wounds had a large defect posteriorly resulting in a sucking wound. Here thoracotomy was followed by swinging a large muscle flap to cover the defect.

Casualties with serious wounds of the head and neck were few among the survivors. Almost all high velocity penetrating wounds are immediately fatal (9).

Our cases on the whole suffered from low velocity injuries. the small number of survivors from high velocity missiles had tangential wounds resulting in compound skull fractures, severe soft tissue loss and brain destruction. Unlike other wounds, head wounds were closed, dural defects in particular being covered, and in one case a rotation flap was used.

Maxillo-facial wounds were only dealt with by the Advanced Surgical centre when they presented an airway problem. Tracheostomy was carried out with minimal further attempts to deal definitively with the wound in 3 cases. No attempts were made to remove the wounding fragments if they were not obvious or easily accessible.

It should be emphazied that only life and limb saving surgery was carried out at this level, and thus our work in a way was greatly simplified. The extensive problems that will follow, such as those of reconstructive surgery were not considered and are beyond the scope of this report. Post operatively casualties were held for as short a time as possible compatible with the nature of the surgical procedure and the availability of helicopter transport. Rearward evacuation took place from 1 to 36 hours after treatment and was to the hospital ship *SS Uganda*. The maximum flight time from the most forward surgery centre *(Fitzroy)* was approximately 40 minutes, and our casualties tolerated this extremely well.

Agent	Site of injury	Cause of death	Time of death
Bomb blast fragments	Small intestine Inferior vena cava	Haemorrhagic pancreatitis	14 Day post -op on *SS Uganda*
Gunshot wound	Pancreas Head	Gross brain damage	24 hours postoperative on *SS Uganda*
Anti-tank mine	Pelvis Perineum both legs	Uncontrollable bleeding Massive tissue loss	Died on operating table table at *Fitzroy*

Table 5. Details of 3 deaths

Results

There were 3 deaths and details of the cases are given in Table 5. The figures only reflect the immediate mortality. It is beyond our scope to deal with the long term results though it is hoped to present there is a later study. We are, however, happy to record that no further deaths have occurred (to this date) following evacuation and repatriation.

Discussion

Sited as they were on East Falkland, the four army teams functioned as Advanced surgical centres. This was necessary because of the manner in which the battle was conducted and the difficult terrain. Surgical facilities further to the rear would have posed insurmountable problems in casualty evacuation as helicopters were in short supply, had a limited load carrying capacity and many had no night flying capability.

Conventionally, casualties having been initially treated by their Regimental Medical Officer at the Regimental Aid Post, are evacuated rearward by road or air to a Field Ambulance. Here resuscitative measures are checked and continued and casualties sorted, such that the most seriously injured are preferentially further evacuated by air, road or rail to a well equipped Field Hospital. Advanced Surgical Centres short circuit the chain but are less than ideal in many respects. The equipment is basic, though adequate, and is geared only to life or limb saving surgery.

It is tempting to draw comparisons with reports from other Campaigns (2,5,7,10-14). However, there were aspects of this was which makes direct comparison difficult. In Vietnam the American Surgical Services were all permanent installations, on a grander scale with sophisticated laboratory and diagnostic equipment available. Specialist teams were on hand to deal with regional injuries. Thus head wounds were dealt with by neurosurgeons and chest wounds by thoracic surgeons (3).

The reports from the Yom-Kippur War show that the Israeli Armed Forces are provided with echelons of medical care similar to those planned by the British Army Medical Services, with surgical facilities usually well back at the 3rd echelon (15). However, their lines of communication were short with some civil base hospitals close to the fighting. This is also true of Northern Ireland. In the Falklands War the difficulties of logistics, transport, communications, terrain and bad weather necessitated the tactical advancement of the surgical facilities available, in order to provide adequate surgical treatment for the casualty as close to the point of wounding in both time and distance.

Not since Anzio in 1944 have surgical teams worked in isolated groups on a beach-head with small advanced surgical centres close to the fighting, with only the basic equipment and the ships functioning as base hospitals (16). The concept of the ASC is not new (13). It worked well. It provides surgical care, basic at best, at a forward level and is aimed at those patients who would have otherwise died if the conventional approach to surgical support had been adopted. It is worth commenting that no insurmountable clinical problems were encounted by the surgeons, most of whom were of junior hospital doctor status. Only one consultant worked at an Advanced Surgical Centre (WSP McG). The training of surgeons in the British Army includes time spent in all major surgical specialities in addition to the normal training in general surgery. Most of us approached the conflict with a certain amount of apprehension concerning our ability to deal with the widespread range of clinical problems we would encounter, though previous service in Northern Ireland undoubtedly provided a framework of experience. In the event there were no particular difficulties. The thoracic problems we encountered should all be within the competence if a general surgeon, though neurosurgical injuries posed difficulties. However, we feel that a neurosurgeon, whilst needed in a field or Base Hospital has no place with a Field Surgical Team in an Advanced Surgical Centre.

The extremely low mortality experienced by us deserves comment. With very few exceptions our patients were evacuated from close to the point of wounding by helicopter and taken directly to resuscitation and subsequently surgery, either at an Advanced Surgical Centre or to the Dressing Station of 16 Field Ambulance which had an advanced surgical centre co-located with it (FST 1 and 6). The Dressing Station provided a useful filter, treating the minor wounded and passing on Priority 1 Casualties to the Surgical facilities. Evacuation times, however, from wounding to surgical care varied considerably from several minutes to several hours, and though most patients reached surgery quickly, there are many reported instances of considerable delays particularly following night battles because, as has already been mentioned, not all helicopters could fly at night. On several occasions casualties were brought to us who had been wounded at the start of the night battle, and had waited all night on the mountains for evacuation at first light. It is likely, therefore, that some of the more seriously injured died before evacuation was possible thus paradoxically improving our survival figures at the surgical centres. However, in contra-distinction, a very short evacuation time presented us with a live patient who had received wounds which inevitably would and did prove fatal (Table 5, patient 3).

Argentinian casualties presented a significant group and it is sad that we have no information on their fate. Most were transferred to Argentinian Hospital Ships from *SS Uganda*.

The final common pathway for all our cases was to the hospital ship *SS Uganda*. We are very grateful to our colleagues of the Royal Navy who ran this floating hospital, and who absorbed casualties directly when the advanced surgical centres were overwhelmed, particularly for example with the burns cases after the Bluff Cove bombing. Without them the Advanced Centres would have been flooded and thus rendered relatively ineffective.

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