

# OPERATION CORPORATE – THE SIR GALAHAD BOMBINGS

## Woolwich Burns Unit Experience

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### Summary

During Military Operations in the South Atlantic to recover the Falkland Islands in 1982, the troopship Sir Galahad was bombed. Initial treatment of the injured in field medical units was followed by transfer to the hospital ship SS Uganda and evacuation to the United Kingdom where 48 patients were treated in the Burns and Plastics Unit, Queen Elizabeth Military Hospital, Woolwich. The treatment of these patients is described and the management of war burns discussed.

### Introduction

On 8 June the Royal Fleet Auxiliary SIR GALAHAD was at anchor in Fitzroy Bay. The 1st Battalion Welsh Guards, support troops, their equipment and munitions were on board. They were awaiting disembarkation from Bluff Cove as part of the force involved in the coming assault on Port Stanley when, at approximately 1700 hours local time, the ship was bombed by Argentinian Sky Hawk jets. At least one bomb exploded at the rear end of the tank deck which was the main assembly point for troops and their equipment ready to leave ship. The blast caused secondary detonation of a considerable amount of munitions, including mortar ammunition stored directly below the ship's main hatch forward of the superstructure. Troops were killed or injured by flash, blast and secondary missiles from multiple explosions. A total of 78 soldiers were burnt. Within minutes of the attack a massive evacuation of the ship was started, using helicopters, lifeboats, landing craft and inflatable rafts. Many wounded troops were successfully carried ashore, although all their equipment was lost.

Medical facilities at Fitzroy were limited, as all the Field Ambulance equipment had been lost on board the SIR GALAHAD during the bombing. First aid was given and the wounded evacuated as soon as possible by helicopter to Ajax Bay where the main shore-based medical facilities were stationed in a disused refrigeration plant. Some of the injured were transferred directly to ships in San Carlos Water. All were ultimately evacuated to the hospital ship SS UGANDA which itself was under pressure to evacuate as many wounded as possible, to make room for the large numbers of casualties expected from the planned attack on Port Stanley<sup>1</sup>. Those fit enough were therefore transferred from UGANDA to the smaller hospital transport ships, HECLA, HERALD and HYDRA for passage to Montevideo and onward flight in RAF VC 10 aircraft to the UK via Ascension Island. On arrival in UK, wounded were held overnight at the Princess Alexandra's Hospital, Wroughton, and then dispersed to other military hospitals in England.

### Management

Of the burnt soldiers who reached the UK, 27 were considered sufficiently healed to be sent home on sick leave, three were transferred to the RAF Hospital, Halton, and 48 were transferred to the Burns and Plastics Unit at the Queen Elizabeth Hospital, Woolwich.

The field medical documentation and hospital case notes of those patients treated at Woolwich were retrospectively analysed. Each soldier was interviewed to make good any omissions in the



*The Sir Galahad on fire in Fitzroy*

necessarily brief field records and to provide background information for construction of the historical picture.

### In the South Atlantic

Immediate first aid at Fitzroy included hosing down of burnt areas with cold water and application of basic field dressings<sup>2</sup>. As all medical stores had been lost in the ship, the two field surgical teams from 2 Field Hospital, supported by 16 Field Ambulance, had an extremely limited capacity<sup>3</sup>. However, shore-based infantry units, already established and equipped, were on hand to provide intravenous fluids, drip-giving sets and further field dressings.

After receiving their basic first aid, casualties were transported by helicopter as quickly as possible, many within half an hour, to the medical unit at Ajax Bay. Space and resources at the refrigeration plant in Ajax Bay were also limited, so about half the patients were transferred to medical holding facilities prepared aboard FEARLESS, INTREPID and ATLANTIC CAUSEWAY.

At Ajax Bay patients were routinely given intramuscular penicillin and booster doses of tetanus toxoid<sup>4</sup>. Morphine was available for pain relief. Hand burns were cleaned with cetrimide solution and put into plastic bags containing silver sulphadiazine cream until the supply of bags ran out. The remaining patients were given saline-soaked field dressings until plastic bags were again available on the Uganda. Other areas were treated with saline soaks which were replaced with occlusive silver sulphadiazine dressings on UGANDA. Faces were left exposed after cleansing. Other injuries such as shrapnel wounds were debrided and treated as required.

Fourteen patients with greater than 10% burns were resuscitated with intravenous fluid drips begun either at Fitzroy or later at Ajax Bay. Eight of these were catheterised. Of a further 19

patients with 6-10% burns, nine required intravenous drips, and two of these were also given a urinary catheter. A total of 10 patients required catheters, three of which were inserted at Ajax Bay and the rest on board the hospital ship UGANDA. The main fluids used at Fitzroy and Ajax were sodium lactate and Polygeline.

As most had been exposed to flash and smoke in the confines of the ship, steroids were administered, before transfer to the UGANDA, to 29 patients, roughly half of whom had one dose of hydrocortisone 100mg intramuscularly, the rest having 1 gram of Methylprednisolone intravenously six hourly.

Most patients were transferred by helicopter to the hospital ship UGANDA within 24 hours. Here intravenous resuscitation was continued using Dextran 70 in those still with high haematocrit levels many hours after injury. The drip rate was controlled by reference to hourly haematocrit levels measured on a hand-held battery-powered centrifuge, using a regime now known as the "Uganda Rule" (Table 1).

Hourly Haematocrit	Rate of infusion for 500 mls Dextran 70
>60	2 hourly
50-60	4 hourly
<50	6 hourly

Table 1 "The Uganda Rule"

Surgery on the UGANDA was necessarily kept to a minimum. The most severe facial burns were treated with eyelid split-skin grafts and tarsorrhaphies for corneal protection. A few escharotomies were carried out, as well as emergency surgery for other injuries. Parenteral prophylactic antibiotics, started at Fitzroy if available, or otherwise at Ajax Bay, were continued orally for five days.

Two patients, one who developed a haemo-pneumothorax, and the other who required revision of a traumatic below-knee amputation, received blood transfusion at Ajax Bay. Blood was given to two other patients on the UGANDA with 26% and 45% burns respectively. In the relatively calm conditions of the SS UGANDA, blood was cross matched before transfusion, although at Ajax Bay group compatible blood was used without waiting for the result of emergency cross match. No transfusion reactions have been reported so far.

## In the United Kingdom

The Queen Elizabeth Military Hospital Woolwich received 48 burns cases from the SIR GALAHAD, amongst other casualties from the South Atlantic. The Burns and Plastics Unit at Woolwich has 28 ordinary beds and six high care beds in a self-contained burns ward. At the first indication of the expected casualties all routine plastics patients were moved from the unit and booked operations were postponed. Spare beds were made available on a general surgical ward for overflow of the less severe cases, and extra nursing staff were transferred from other parts of the hospital. The day-to-day running of the unit was carried out by the army consultant in burns and plastic surgery assisted by one junior doctor. On days when large numbers of casualties arrived together, junior doctors from other surgical departments were encouraged to help in initial reception and clerking of patients.

A total of 48 male patients, aged between 18 and 41, all injured on 8 June 1982, were admitted to the Queen Elizabeth Military Hospital from 18 June to 2 July (Table 2). Twenty-five arrived on the first day and 46 had arrived by the end of the first week.

All had burns of varying degrees to their hands. Forty-two patients had burnt faces, 33 had burns on other parts of the body and eight had associated non-thermal injuries (Table 3).

By the end of June de-slough and split skin grafting had been carried out on 40 hands among 23 soldiers. Due either to

% body surface area burn (Range 1-45%)	No. of Patients
<5	15
6-10	19
11-15	4
16-20	6
>20	4
<b>Total</b>	<b>48</b>

Table 2 Body Surface Area Burn of Sir Galahad victims

	Conservative	Surgical	Total
Hands	49	44	93
Faces	40	2	42
Scalps	0	6	6
Trunks	6	1	7
Limbs	17	3	20

Table 3 Burn Wounding by Region and Treatment Method used

	Conservative	Surgical	Total
Full employment	18	3	21
Limited employment	2	20	22
Hospital in patients	1*	4	5

Table 4 Employment Status related to Management (as at December 1982)

\* Due to non thermal injury

incomplete de-slough or graft failure, 12 hands (seven patients) required early re-grafting. Surgery was carried out to other areas as shown in Table 3. Kirschner wires were used on five patients to prevent finger joint contracture. Of the faces only two required any grafting, the remaining superficial flash burns healing conservatively with exposure. Twenty-five patients had superficial hand burns which healed sufficiently with conservative management to allow them to be sent home on sick leave within three weeks of injury.

In early July the last two patients arrived, delayed in one case by septicaemia in a 45% body surface area burn, and in the other by revisionary surgery to a traumatic amputation of the leg. The former underwent an extensive series of reconstructive operations including bilateral tarsorrhaphy, bilateral split skin grafts to upper and lower eyelids followed by Wolfe grafts to the same areas, and split skin grafts to other parts including the hands, arms and scalp. He required nine general anaesthetics before the end of September.

## Results

By the end of 1982, 21 soldiers had returned to normal employment. Of these 18 had been treated conservatively. A further 22 patients were employed in a limited capacity. They had varying degrees of web space contracture, scar hypertrophy and skin breakdown, and were being treated as out patients with pressure garments, while three were admitted in December for further grafts. Of this grouping in limited employment, only two were treated conservatively. Five soldiers remained in hospital.

Two patients, after early repeated split skin grafting, required full thickness cover to deep burns over the dorsum of finger joints. Axial pattern groin flaps<sup>5</sup> were successfully fashioned in both cases, although thermal damage was so extensive that joint implants and tendon transplants will be required.

Late breakdown of extensor skin over finger joints occurred in two of the conservatively managed group and four of those initially grafted. Apart from one who required a full thickness cross arm flap, all underwent thick split skin grafts.

From the group in which Kirschner wires were used, two remained hospital inpatients to allow their axial pattern flaps to mature. The other three were transferred, after grafting was complete, to the Joint Service Rehabilitation Unit at Chessington, for active full-time physiotherapy. At the end of 1982 one of these was back at work as a heavy goods vehicle driver and the other two were awaiting re-admission for further corrective surgery.

None of the patients interviewed many months after the event admitted to any respiratory trouble either at the time of smoke inhalation or later, whether or not they had been treated with steroids.

Continued use of pressure garments has been required to counteract hypertrophic scarring and web space contractures in 24 hands (15 patients). In this group only one pair of hands was treated conservatively. Hypertrophic scarring requiring similar treatment occurred in three other burnt areas, all treated conservatively.

By the end of 1982 64 operations on 27 patients under general anaesthetic had been performed by the Unit.

## Discussion

**Distance:** Casualty evacuation over a distance of 8,000 miles presents enormous problems administratively, logistically and for the patient. With many transfers from ship to ship, ship to aeroplane and hospital to hospital in the UK, the journey from the SS UGANDA to the Queen Elizabeth Military Hospital, Woolwich, took an average of six days. The nearest usable air base to the combat zone in the Falklands was 1,100 miles away at Montevideo. Patients stabilised on UGANDA were transferred to hospital transport vessels, which had been converted from survey ships, for the journey to Montevideo. From there they were flown to the United Kingdom via Ascension Island. This was a substantial achievement; the American forces in Vietnam used permanent air bases relatively close to the fighting and were able to use large jets, taking 20½ hours for a journey similar to that between the Falklands and the United Kingdom to evacuate patients in large numbers direct to the United States<sup>6</sup>. In the early stages of the Vietnam war most of the serious cases were evacuated rapidly, sometimes within 24 hours of wounding, but as larger more specialised medical facilities were established in the war zone, transfer of these patients was delayed and definitive treatment started immediately<sup>7</sup>. British soldiers arrived in England tired, confused and some in great pain. The length of the casualty evacuation chain precluded any reconstructive surgery in the South Atlantic for burn cases. Emergency surgery included amputations, escharotomies and tarsorrhaphies which were carried out as indicated, but no definitive grafting was started until arrival in the UK two weeks after injury.

**Early Treatment:** In order to cope with a large number of casualties in a short period of time there needs to be an established well rehearsed regime for burns treatment on the battle field. Intravenous fluid replacement in the shock phase for large numbers can be adequately controlled by following Sorenson's Dextran formula as adopted by the Army<sup>8,9</sup>. Experience on the

hospital ship has demonstrated that large numbers of patients in the shock phase can be adequately monitored by hourly haematocrit levels using the 'Uganda Rule'. Despite this, some will still be either under or over-resuscitated, but this is compensated for by the fitness, age and morale of professional soldiers in a regular army. Superficial burns of hands dressed conventionally with bulky bandages make otherwise fit patients dependant on others. However, plastic bag occlusion allows the patient a degree of mobility and self help, relieving overworked nursing and auxiliary staff for the more extensively injured<sup>10</sup>. The exposure treatment of burns is well documented<sup>11</sup> and this applies particularly to superficial burns of the face which require virtually no maintenance, a factor of importance when dealing with large numbers.

**Protective Clothing:** To a limited degree clothing can give protection from burn injuries. The SIR GALAHAD victims were dressed for cold wet conditions with many layers of combat clothing, although the hands and head were uncovered. Two soldiers who were wearing gloves suffered only minor superficial blistering to the hands. Some wore plastic waterproof outer clothing with a hood, which was typically bunched up behind the head. This caused deep burns where it ignited and fused to the scalp. Others wore thick arctic parkas which gave a good degree of protection, particularly when the face was protected with the hood, as demonstrated by one quick-witted soldier who, although losing a leg, had no facial burns. Except for those close to the blast, multiple layers of clothing gave considerable protection. Analysis of this incident shows that despite the large numbers of casualties involved, many were of a relatively minor nature and might have been prevented. Flash protective clothing, as worn by the Royal Navy crews, could protect many hands and faces although both availability and troop compliance are likely to cause difficulties.

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