

Kosovo 1999 - A Surgical Template for Modern Conflict

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ABSTRACT

246 surgical operations were performed in a UK Field Hospital over an eight month period during Op AGRICOLA in 1999. Whilst there were many injuries caused by military weaponry, non-conflict related injuries were also common. Sixteen laparotomies were performed, nine for mine and gunshot injuries, seven were for 'peacetime' causes. Four extremity external fixators were applied - three after high energy transfer fragment wounds to bone and one after a road traffic accident. One pelvic external fixator was applied. Six limbs were amputated, three in one child. Eight split-skin grafts and three local flaps were performed. Wound debridements (including delayed primary suture), of which half were due to fragment and bullet wounds to non-vital structures, were the most common operation performed. Of the 246 consecutive operations analysed, 91 were performed solely by the orthopaedic surgeon. There were 29 combined cases where one surgeon actively assisted the other. 146 operations were performed on local civilians. A consultant orthopaedic surgeon and a consultant general surgeon along with experienced anaesthetic and operating theatre staff remains the combination best suited to provide medical support to future military operations of this kind.

Introduction

The conflict in Kosovo in 1999 resulted in a major military effort by the western powers to avert another humanitarian crisis in the Balkans. The expectation of the deployed medical force was the treatment of the victims of military weaponry. Whilst injuries from mines, grenades and bullets were seen, the surgical care of the victims of road traffic accidents, pregnancy, appendicitis and daily survival were equally, if not more, important. Modern conflicts appear to differ from the general wars of the last century in that greater numbers of civilians are directly involved in the conflict. This paper documents the 246 consecutive surgical operations performed in a UK Field Hospital over the eight month period

between the 9th of March 1999 and the 9th of November 1999.

Method

This review is based on a retrospective analysis from the case-notes and operating logbooks of the Field Hospital from 9/3/99 to 28/8/99 and from prospective data collected from 29/8/99 to 9/11/99.

Background

Medical elements of the NATO forces deployed to the theatre of operations included a 50 bedded element of a UK Army Field Hospital and a UK Army Field Ambulance Group. Their primary mission was to provide front-line, level 3 medical care to the NATO soldiers of Kosovo Force (KFOR). Their secondary mission was to provide, whenever possible, life and limb saving resuscitative surgery to the local community. The surgical and anaesthetic elements within the unit were an Orthopaedic Surgical Team and a General Surgical Team. These surgical teams were generally deployed on recurring one month tours.

From 9 March 1999 until 11 June 1999 the rubber tented Field Hospital was based in Macedonia. The local infrastructure was generally intact and all cases treated were members of the British Army. UK troops crossed into Kosovo at 0500 on 12 June (K-Day). The Field Surgical Team (FST) was moved to Pristina by helicopter on 16 June to cover the advance. The complete unit finally moved to Lipljan - a small town some 18km south-west of Pristina on 26 June 1999. An evacuated mental hospital with intermittent heating, water and electricity was used to house the unit. There was no coherent local infrastructure. Little intrinsic medical support was available to the surrounding communities.

Results

Table 1 lists the overall numbers of all operations performed. Of the 246 operations undertaken during the above period, 91 were performed solely by the orthopaedic surgeon. 146 operations (59%) were performed on local civilians. There were 29 combined cases where one surgeon actively assisted the other. There were three post-operative deaths amongst the twenty-one patients who had sustained non-trivial injuries.

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Table 1 Kosovo 1999 Summary of Operations

	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Row Total
Operations										
Performed (Total)	6	9	6	20	68	62	39	30	6	246
KFOR Personnel	6	9	5	15	19	18	7	18	3	100
General Anaesthetic	6	8	5	19	50	57	26	20	6	197
General Surgery										
I&D Abscess*	1	2	2	2	5	6	1	1		20
Appendectomy		1		3	3	1	1	1		10
Laparotomy		1		4	2	3		4	2	16
Upper/Lower GI Endoscopy					3		1	2		6
Cholecystectomy							1	1		2
Biopsy Skin/Mass					3	3	1	1		8
Herniorrhaphy		1				1				2
Arterial Repair					1		1			2
Mixed										
Wound Debridement	1		2	2	16	20	10	3	1	55
DPS Wound	1			4	12	13			1	31
Split Skin Graft			1	2	3	2				8
Dressing Change		4				1	10		2	17
Rotational/Local Flap					1		2			3
Orthopaedic										
Apply External Fixator					3		2			5
Apply Pelvic External Fixator					1					1
Below Knee Amputation				1	2	1	1			5
Above Knee Amputation					1					1
Shoulder Disarticulation					1					1
MUA Joint Dislocation [#]			2	2	1	2				7
MUA Fracture						1	1	2		4
Tendon Repair					1	1	1	1		4
Debride Open Fracture	3							2		5
Internal Fixation Open Fracture							2			2
Arthrotomy for Septic Arthritis					1	1		1		3
Burr Holes					1		1			2
Miscellaneous				1	8	5	1	10		25

*Ankle, hip, periumate, wrist, subtalar, shoulder (one ant & one post). *Eight pilonidal-remainder buttock and perianal

Table 2 gives further details of the 16 laparotomies performed on 14 patients over the eight month period of the paper; specifically cause, location, findings and procedure. Procedures 2(a) and 11(a) represent the re-laparotomies required on cases 2 and 11 after patient deterioration.

Table 3 gives further details of the external fixators applied. Patient 3 underwent a frame reconfiguration with further pin placement at time of wound closure.

Illustrative Case Reports: - Conflict Surgery

A 14 year old boy picked up a cluster bomb



Fig 1. Perforating jejunal injury following anti-personnel mine explosion

which detonated in his left hand causing; multiple unsalvageable injuries to the limbs, multiple buttock wounds and testicular exposure. He required right above-knee amputation for compound femoral and tibial fractures with soft tissue destruction and left below-knee amputation. An almost complete traumatic amputation at mid-humeral level was converted to a left shoulder disarticulation during resuscitation surgery. He died of his wounds very shortly after transfer to the hospital's two-bedded ITU.

A 6 year old boy threw a stone at a mine. It detonated and he sustained multiple fragment wounds to his legs, genitalia and abdomen. A partial traumatic circumcission was completed; a perforating injury to his testis was closed. Laparotomy was performed and two short lengths of small intestine were resected (fig 1). His legs were debrided and the dorsum of his left foot required a split-skin graft.



Fig 2. Traumatic amputation following anti-personnel mine explosion

A farmer stepped on a mine crossing his field (fig 2). He required an immediate simple below-knee amputation. Blast from the partly buried mine blew soil debris and clothing into the calf and popliteal fossa of the other leg. This resulted in considerable skin loss. The popliteal neurovascular bundle was intact, but considerable granular debris had to be dissected off its adventitia. Over a three week period the patient required five separate debridements, two split skin-grafting procedures and a small local rotational flap to cover the popliteal defect (fig 3). Considerable effort

Table 2. Kosovo 1999 Laparotomies

Laparotomy Case	War Causes Cause	Location	Findings	Procedure
1	GSW	Right Upper Quadrant	Unsalvageable Liver and Renal Trauma	Patient Died
2	GSW	Left Upper Quadrant	Unsalvageable Splenic Trauma	Splenectomy
2(a)	Hypotension	Day 2	Missed Gastric and Transverse Colon Perforations	Stomach Oversewn, Transverse Colon Resected
3	GSW	Upper Abdomen	Seromuscular Tear Transverse Colon Through & Through Injury Descending Colon, Large Jejunal Perforation	Colon Oversewn, Jejunum-Resected
4	GSW	Right Upper Quadrant	Trans - Ilea and Left Lobe of Liver Perforations	Short - Segment Resection
5	GSW	Upper Abdomen	Liver, Gastric and Ileal Perforations	Stomach - Oversewn, Ileum - Resection
6	GSW	Upper Abdomen	Gastric and Diaphragmatic Perforations	Wounds Closed
7	GSW	Right Flank	Colonic & Appendicular Perforations	Appendectomy and transverse Colostomy
8	Mine	Central Abdomen	Multiple Ileal Perforations	Two Lengths of Ileum resected
Peacetime Causes				
9	RTA	Head Injury- Unexplained Hypotension	Negative Laparotomy	Patient Transferred
10	RTA	Hypotensive	Ruptured Spleen	Splenectomy
11	RTA	Multiple Rib Fractures and Tension Pneumothorax	Chest Tube Loss >800ml/hr. Thoractomy Bleeding from Fractured Rib Ends. Laparotomy, Ruptured Spleen	Intercostal Vessel Control. Splenectomy
11(a)	Hypotension	24 Hours Post Surgery	Bleeding from Splenic Bed	Haemostasis
12	Collapse	Suspected Intra-Abdominal Sepsis	Negative Laparotomy	Patient Recovered
13	Hypotension	Suspected Intra-Abdominal Bleed	Negative Laparotomy	Patient Recovered
14	Hypotension	Suspected Ectopic Pregnancy	Tubal Pregnancy	Salpingectomy



Fig 3. Limb salvage after rotational flap and split-skin grafting

Table 3. Kosovo 1999 External Fixation

External Fixation Patient	War Causes Cause	Location	Gustillo Grade (I)	Remarks
1	GSW	Proximal Tibia	IIIB	Medial Gastrocnemius Flap Closure
2	GSW	Mid-Shaft Femur	IIIA	Local Closure
3	High-Energy Grenade Fragments	Distal Tibia	IIIA	Further Pins Added, Bone Shortening Direct Closure
Peacetime Causes				
4	RTA	Femur	II	Direct Closure
5	RTA-Rollover	Pelvis	Closed	Lateral Compression (LC1)

went into limb salvage which would not have been possible in a mass casualty situation. He was able to ambulate without assistance, on an artificial limb, three months after the injury.

A local man was shot through his right flank at close range. He was haemodynamically stable. During early resuscitation it was thought that the bullet had missed his peritoneal cavity. Diagnostic peritoneal lavage was positive and at laparotomy a perforating colonic injury was exteriorized as a double barrelled colostomy. The projectile had also disrupted the tip of the appendix. This was treated by simple appendectomy.

A patient with a left upper quadrant abdominal gsw required wound excision and splenectomy after unsalvageable splenic trauma was found at laparotomy. He developed unexplained hypotension 48 hours after the index surgery. At re-operation, a gastric perforation was found and over sewn and a length of perforated transverse colon was resected.

Illustrative Case Reports :- Non-Conflict Surgery

A KFOR soldier was ejected from a lorry in a rollover accident. He sustained a frontal scalp laceration, a closed petrochanteric fracture of his left femur, a left scrotal disruption with testicular preservation and a fractured pelvis with meatal blood. After application of a pelvic external fixator, suprapubic catheterization and skeletal femoral traction, he was casevaced out of theatre.

A local man was seriously injured in an RTA. At initial resuscitation a tension pneumothorax was treated by emergent needle thoracocentesis and insertion of a chest-drain. 500ml of fresh blood was drained immediately with 1500ml draining over the following 90 minutes. At thoracotomy, bleeding from the raw ends of multiple rib fractures was noted. However he remained profoundly hypotensive and a laparotomy was performed. Splenectomy was required for a ruptured spleen. The

patient had to be returned to theatre 24 hours later with continuing hypotension and decreasing haematocrit. Bleeding from the splenic bed was controlled. The patient recovered and was transferred out to a civilian hospital in Macedonia.

A 59 year old male sustained a severe closed head injury. Fixed dilated pupils were noted during resuscitation. Burr holes were performed prior to transfer to a neurosurgical facility in Macedonia where diffuse cerebral oedema was diagnosed. The patient later died.

A servicewoman was admitted in collapse with acute lower abdominal pain. At laparotomy she required salpingectomy for a ruptured ectopic pregnancy.

Discussion

The nature of modern conflict is changing. When compared to the limited wars of the past two decades, the relatively quieter recent peacekeeping missions to Bosnia, Kosovo and Sierra Leone seem to represent the current norm. Humanitarian intervention to prevent civilian loss of life is now the main reason for force deployment and excessive military casualties are seen as publicly unacceptable.

In the Falklands War, 241 patients were treated at advanced surgical centres(2). These casualties were almost exclusively the soldiers of the two opposing forces. A very similar pattern of military injury was seen during the Gulf war. Of 100 operations performed in a UK Field Hospital between January and March 1991, 63 were as a result of penetrating missile injury. In the 31 British, 3 Egyptian soldiers and 29 Iraqi prisoners of war treated, 80% of wounds were caused by fragmentation devices and 20% by bullets. 76% were limb wounds, with 12% chest and 11% abdominal wounds(3). There was little expectation of high numbers of civilian casualties.

This view should now be changed. Civilian populations have been the major targets in recent conflicts. Powerful explosive devices such as artillery shells and mines may account for most immediate trauma morbidity and mortality but mass killings, where whole villages are slaughtered or undergo sustained sniper attacks are also deemed important, both in terms of overall physical and psychological trauma(4). Breakdown of the local health services may then place the care of the wounded with the medical units of the incoming peacekeeping forces. 59% of all the surgical operations performed in our hospital were on local people.

When civilians are involved, the personal psychology and altered tactics of the armed aggressor and the defenceless victim may result in altered wounding patterns: In general war, the number of people wounded is at least twice the number of people killed:

The ratio may even be as high as thirteen to one. When military weaponry is used in a confined space, or against people who are immobilised, or unable to defend themselves - the wounded to killed ratio can be lower than one or even zero(5). In Kosovo a frequent practice was to throw a fragmentation grenade through the window of the occupied living room or bedroom of a house causing serious injury to the occupants. (figure 4).

Antipersonnel mines have played a



Fig 4. High energy transfer fragment wound to bone after grenade explosion

defining role in many recent conflicts. Although deployed mainly in the construction of defensive lines, they are also used to funnel and constrain troop movements. Often they are sown hurriedly by untrained conscripts and detailed maps are not made or are lost. Made mainly of plastic with an explosive charge of a few hundred grams, they can remain in the ground for many years without losing any of their capacity to maim or kill. About 25% of those injured by such mines require an amputation. The most common site of amputation is below the knee(6). As in Cambodia, children are often the victims long after the conflict has ended. In Kosovo, NATO and various non-governmental agencies (NGOs) ran aggressive information campaigns aimed at children. Mine warning leaflets in Albanian and Serbo-Croat were widely distributed.

A broad knowledge base will therefore be necessary for those surgeons who deploy on

future campaigns. There are definitive surgical trauma skills that must be learnt and kept current: these should include the basic gynaecologic and neurosurgical procedures. Competence in plastic surgical techniques is also necessary in conflict surgery(7). In the series reported here a medial gastrocnemius flap was used to cover an open proximal tibial wound after a gsw. A local rotational flap was necessary to cover an extensive popliteal wound following a mine-strike. In addition, eight split-skin grafting procedures were undertaken. Absence of such skills would have resulted in limb loss in at least two patients. Bilateral Cutler V-Y advancement flaps were used to cover an exposed digital terminal phalanx after trauma. This procedure allowed a soldier to remain in theatre.

The difficulty of predicting the path of a bullet or fragment merely by the location of its entrance and exit wound is a another lesson learnt early in conflict surgery(8). A formal, careful laparotomy is necessary for all penetrating abdominal war wounds. Although some injuries were missed and several laparotomies were negative this should not be seen in any way as a failure - more a consequence of the limited facilities available during the conflict. We had no ultrasound scanner until late August and no CT facility at any time.

In summary then, although there were always sufficient anaesthetic and technical resources for two separate operating tables to be working at the same time (as may be needed in mass casualty situations) :- The current concept of operations of the British Army is that the orthopaedic surgeon and the general surgeon work together as a team. Obviously every surgical emergency cannot then be catered for but each surgeon's individual skills in plastic, gynaecologic or neuro-surgery are then summative. Not all surgery undertaken will be for conflict related reasons and the medical needs of the local population may

place the greatest demand on our already limited resources.

Conclusion

This broad spectrum of conflict and non-conflict related surgery, affecting mainly the local population, will be the template for future military operations of this kind. A consultant orthopaedic surgeon and a consultant general surgeon along with experienced anaesthetic and operating theatre support staff remains the combination best suited to cover such a deployment.

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Acknowledgement

I would like to acknowledge the help of Lt Col Jon Clasper FRCSEd(Orth) RAMC, who aided me with the preparation of this manuscript and to acknowledge all the surgeons, anaesthetists and theatre staff who served in Kosovo during 1999.