

# Commentary on “Wounded treated at the Royal Naval Hospital, Plymouth”

Surg Cdr A Lambert OBE



**Original article**

**Authors:** Anon. (The medical officers)

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The work of this hospital only began to assume a special character with the arrival, on the 15th October, of a convoy of 673 sick and wounded Belgian officers and men. Among the cases were upwards of 250 suffering from various medical affections, more or less directly connected with the prolonged periods of exposure and fatigue to which the men had been subjected. Thus not less than 133 cases were included under such headings as rheumatism, lumbago and sciatica, whilst about 50 were suffering from bronchitis and other affections of the lungs. A further group of about 156 included a variety of surgical affections and injuries, other than those of gunshot wounds; among these, contusions and sprains, fractures and ordinary wounds preponderated. In the case of the wounded the injuries were in many cases of several weeks' duration.

The wounds caused by rifle bullets and shells numbered over 200, and can be grouped together with those occurring in the English wounded admitted a fortnight later. These, to the number of 212 officers and men, reached Plymouth by hospital ship on 29th October, and consisted almost exclusively of wounded. Among these cases the wounds were much more recent, having in most instances been received a week or less before the date of admission. The wounds by bullet and shell in these series numbered 185 in 182 individuals. Grouping together the wounds in the two series of cases the total is 389.

The following table gives the position and condition of the wounds in those produced by rifle bullet and shell-fire respectively. Among the cases in which a bullet had traversed the muscular part of a limb, it was frequently noticed that, even in the absence of bone or joint injury, a considerable degree of stiffness of the part persisted after the wound had healed, with limitation of the movements of the neighbouring joints, and with a tendency to muscular

contracture. This was especially noticeable in bullet wounds of the forearm and leg. Among the nerves injured were the musculo-spiral, median, ulnar, great sciatic, and external popliteal. In one case of median nerve paralysis, the bullet track was firmly healed, except at one end, which admitted a fine probe for a short distance. On exposing the nerve it, was found to be surrounded by a curious dark substance, which proved to consist of fluffy material from clothing incorporated in scar tissue. This was dissected away and the nerve set free.

	Rifle Bullet		Shell	
	Healing or healed	Suppurating	Healing or healed	Suppurating
Head	15	3	9	8
Neck	6	1	4	-
Chest	8	2	4	-
Abdomen	2	-	1	1
Back	2	3	5	3
Perineum	-	1	-	-
Hip, buttock, groin with (scrotum, 1)	14	2	5	6
Thigh and knee (with scrotum, 3)	22	12	13	9
Leg and ankle	16	15	8	9
Foot and toes	13	7	6	6
Shoulder	12	7	5	5
Arm and elbow	7	8	8	3
Forearm and wrist	17	13	7	1
Hand and fingers	11	24	7	9
Multiple	1	1		
Totals	147	99	83	60
	246		143	

Table 1: Mechanism and region of injury with details on subsequent infection.

In another case of healed bullet wound of the forearm, a peculiar spastic condition of the flexors of the fingers and muscles of the thumb was present, and there was marked impairment of sensation of the hand and fingers, the only definite feature elicited from the patient, a Belgian, being that “the little finger was all right.” Operation revealed a flat white scar covering the median nerve at the level of the upper border of the pronator teres. This was removed and the nerve wrapped in Cargile membrane. By the third day

*the spastic condition of the hand was less, and the patient could voluntarily flex the last joint of the thumb.*

*Even in cases presenting no obvious evidence of nerve lesion, areas of impaired sensation in the limb were found in several instances, and would probably prove not uncommon if systematically searched for in a series of cases. In the case of an officer who had been shot antero-posteriorly through the middle of the leg, there was well marked impairment of sensation on the dorsum of the foot and on the two inner toes. The extensor brevis digitorum was also paralysed, thus suggesting an injury of the anterior tibial nerve. The remarkable absence of symptoms often observed in cases in which a rifle bullet has traversed important structures is well known. In one Belgian soldier a bullet entered the chest at the level of the ninth rib in the left mid-axillary line, and was removed from beneath the skin over the ninth rib on the right side, at a point rather anterior to that of entry. The bullet must thus have passed through the pleura, liver, stomach, and probably the spleen. No ill results followed, although the occurrence of a rigor, a temperature of 104.4° F, five weeks after the injury, with some rigidity of the right rectus, suggested the possibility of sub-phrenic suppuration. Three weeks have since elapsed, and the man remains well.*

*In another case a shrapnel bullet entered the right side of the back of the neck and, passing forwards into the lower jaw on the same side, knocked out the wisdom tooth and partially fractured the bone. The bullet was easily removed from the alveolus. The treatment of suppurating wounds with hydrogen peroxide and iodine baths has been attended with good results, the dressings consisting of cyanide gauze or boric fomentations, according to the profusion of the suppuration and the amount of the surrounding inflammatory swelling. X-ray examination in such cases is very advisable, with the object of detecting the presence of metallic foreign bodies or bone injury. Even when such examination is negative, exploration under an anaesthetic is often advisable, in order to secure free drainage and removal of any fragment of clothing which may be present.*

*Many of the bullet and shell wounds of hands and fingers were admitted in a very septic state, but the majority rapidly improved with treatment. In the hand the bullet often passes through from dorsum to palm, and the aperture of exit presents an appearance as if the part had been burst open. In such cases X-ray examination has frequently shown comminuted fractures of the metacarpals, and the appearance of several hands, thus damaged, suggests that healing will be delayed by a varying degree of necrosis. In the case of the fingers, amputation may be unavoidable, but in general conservative treatment has been adopted. This has especially applied to those cases in which the ends of two or more fingers had been blown away, and septic stumps*

*remained. The operations performed in connexion with the series of 389 wounds numbered 76, excluding a number of trivial procedures, such as the removal of a subcutaneous foreign body. The operations were as follows:*

Exploration and drainage of septic wounds	15
Removal of bullets, etc.,	41
Amputation of fingers	9
Nerve repair	3
Tendon repair	1
Removal of eye	2
For skull fracture	1
For Abdominal Abscess	1
Ligature of sub-clavian artery	1
Amputation at shoulder	1
Amputation at thigh	1
Total	76

Table 2: Details of Surgical procedures performed.

*The amputation of thigh was performed successfully for an intensely infected comminuted fracture of the upper end of the tibia, caused by a rifle bullet at short range. The man after being shot had crawled about un-helped for four days. The amputation at the shoulder, performed on the day of writing, was undertaken for a bullet wound of the axillary artery, with profuse suppuration and followed by gangrene of the limb. Among the operations performed before admission were amputation of thigh (2); drainage of suppurating knee-joint, (1); removal of bullets, etc., (11); and several amputations of fingers.*



Figure 1: Patients on deck of HM Hospital Ship Garth Castle.

*Two major operations were successfully performed on board the hospital ship - trephining for depressed skull fracture, and amputation of the arm for emphysematous gangrene. Except in those cases in which a bullet or fragment of metal could be felt beneath the skin or by probing a wound, the presence and position of the foreign body was determined by X-ray examination. In all 180 cases were examined in*

the X-ray department. In 53 cases bullets or fragments of metal were found: rifle bullets in 15, shrapnel bullets in 13, and fragments, often multiple, in 25. In 57 cases fractures were present, and in 30 the absence of bone injury was determined. In one case a rifle bullet had drilled a small hole through the upper end of the tibia. In another case a shrapnel bullet was localized in the base of the right lung, and could be seen rising and falling with the diaphragm. In cases in which it was particularly important to determine the relation of the foreign body to a bone, the stereoscopic or the triangulation method was also used.

In dealing with bullets or metallic fragments localized by X-ray methods, and in the absence of an unhealed wound in the immediate vicinity, the incisions were planned with a due regard to the anatomy of the part, and in only three cases was the search abandoned. Two of these were small fragments, and might well have been left alone; in one a shrapnel bullet, thought to be lying on the back of the sacrum, was found by rectal examination to be lying in front of the bone. Indeed the presence of a bullet, detected only by X-ray examination, in the entire absence of symptoms or disability, and in the absence of an unhealed wound likely to be kept open by it, does not necessarily call for an operation. One fact, often mentioned by others, was frequently noticed the difficulty of feeling a bullet, even a large round shrapnel, in the tissues of the operation wound. This applies particularly to a probe, and renders the use of a finger often unavoidable. When a fracture is present, particularly if comminuted, the difficulty of distinguishing metal from bone has been found to be very great, and in such cases, as well as in those in which a metallic fragment is present in a sinus, the telephone probe has proved of real utility. In two cases in which the track had otherwise healed, the retained bullet was found to be lying in a small abscess cavity, in one case situated beneath the insertion of the brachialis anticus muscle.

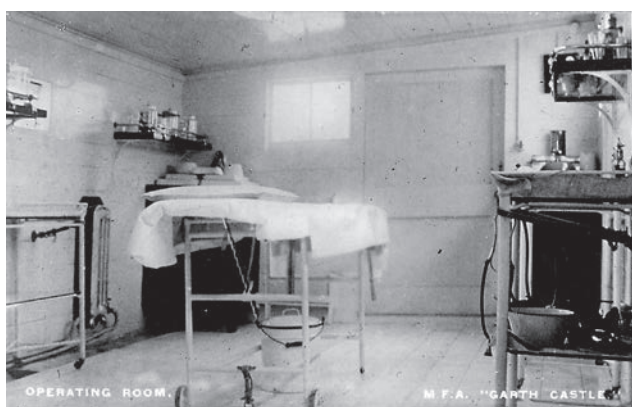


Figure 2: Rudimentary surgical facilities onboard HM Hospital Ship Garth Castle.

It was frequently noticed that the rifle bullet, before coming to rest in the tissues, had turned so that its apex pointed

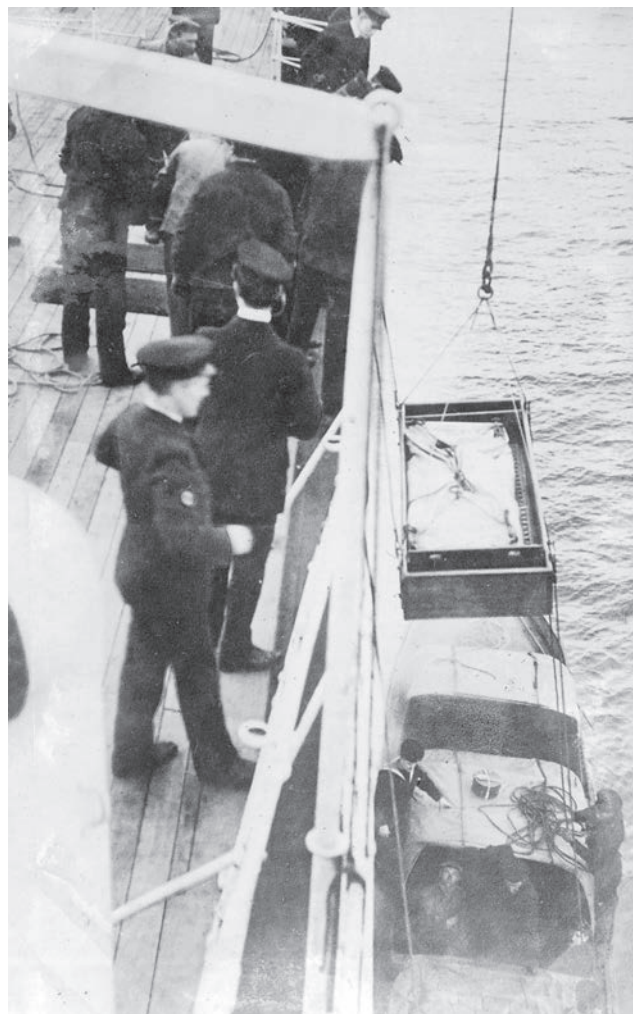


Figure 3: Casualties being transferred to a launch prior to being landed in the UK.

more or less towards the site of entry. In some cases this was doubtless due to contact with a bone, but may have been explained, as has been suggested, by the fact that on account of the extremely conical shape of the bullet the centre of gravity is so near the base. It may well be supposed that, in some cases, the extensive damage produced at the aperture of exit may be due to the bullet leaving the body broadside on or base first. Tetanus antitoxin has been very freely used, and no case of tetanus has so far occurred in the hospital.

#### Commentary

During World War One (WWI), the Royal Naval Hospital Stonehouse was serviced by Stonehouse Creek and the patients arrived by ship (see Figures 1-3). In the present day, casualties arrive by air lift, so their transit time is much shorter – hours from point of wounding on occasions, rather than days. In this way much smaller numbers of casualties are received more frequently at Role 4 (United Kingdom Hospital). This is a stark contrast with the situation faced 100 years ago when over 600 hundred casualties arrived at

the same time at Plymouth and less than two weeks later another 200 casualties arrived, as detailed in the article by 'the Medical Officers'.

While rapid transfer back to the UK might mean more medically unstable patients arriving at Role 4, a positive effect is that casualties no longer arrive with festering wounds. One aspect that has not changed in the last one hundred years is that all the wounds are still best treated by exploration and debridement. Such treatments are labour intensive and individual patients can be returned to theatre many times.

The surgical resources needed by casualties during recent conflicts are much higher than in WWI. This is because of the improved survival rates, which are a direct result of care provided by the troops at the point of wounding; the speed that they return to the deployed Role 3 surgical facility; the experience in that facility; the fact that seriously injured casualties can be air lifted to a Role 4 facility in under 24 hours; and the expertise at all levels that has evolved over the twelve years of conflict in Afghanistan.

Casualty numbers are smaller now than in WWI, due to the nature of the conflict. Whereas the casualties were previously spread around the country, tending to migrate back towards their home town, the Royal Centre for Defence Medicine in Birmingham has become the single point of entry for returning casualties at this time and transfer to their home town does not occur. If the casualty numbers were to significantly increase, a process is ready for the dispersal of these casualties around the UK.

Since the start of operations in Afghanistan, the Role 3 hospital at Camp Bastion has developed from a tented facility to a state of the art hospital with many of the facilities of a UK civilian hospital. This, in association with the improved living and fighting conditions of the troops, has seen the number of individuals with chronic infections and non-battle injuries returning from the front line reduce significantly, although there is still a 'steady trickle' of both.

With the current conflict coming to an end, the Royal Naval Medical Service will need to re-learn some of the lessons of WWI, as we move away from this mature theatre of operations and back to conventional warfare. In the near future, casualties will be evacuated to Role 1 and Role 2 facilities before arriving in Role 3 hospitals, and the first call of the unit on the ground will no longer be for 'the MERT' (Medical Emergency Response Team), it will be for 'the Medic' - the faithful Medical Assistant.

Deployed doctors of all disciplines, but especially the surgical specialties, will need to ensure that they hone the basic principles and skills required to treat a wounded marine, soldier, sailor or airman, as without the support of others in their facility they may be required to operate well outside the comfort zone of their non-deployed specialty.

**Author**

Surgeon Commander A Lambert OBE FRCS (Gen), RN  
Consultant General Surgeon  
Derriford Hospital NHS Trust, Plymouth

**Correspondence** [saddadz@live.co.uk](mailto:saddadz@live.co.uk)