BRITISH MEDICAL JOURNAL

LONDON SATURDAY OCTOBER 7 1944

SURGERY IN TUNISIA: NOVEMBER, 1942, TO MAY, 1943

BY

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It is proposed to give a short outline of the campaign in North Africa, to describe the general lay-out of the medical units with the force, and to indicate some of the points of interest and lessons learned during that period.

In Nov., 1942, American and British forces landed at various points on the coast of North Africa. The British force—called the First Army, but in reality at this time only two infantry brigades, a tank regiment, and auxiliary services—made landings on the coast of Algeria. The subsequent campaign may be divided into various phases: (1) the thrust forward of the First Army into the hills overlooking the plain of Tunis; (2) the build-up of the force; and (3) the final attacks on Bizerta and Tunis. During the first phase there was heavy fighting to establish our positions in the hills around Beja, Medjez-el-Bab, and in the north round Sedjenane. The build-up occupied the winter months and early spring of 1943. During this period there was continuous hard fighting in the hills, which culminated in the capture of Longstop Hill and other key positions and made possible the final break-through to the plains of Bizerta and Tunis. Towards the end of this period the Americans had moved up from the south and taken over the northern sector of the line. The Eighth Army, in pursuit of Rommel, had broken through the enemy lines at Mareth and the Wadi Akarit and occupied Gabes and Sfax. The British and French forces held the central sector. The

and much improvisation was necessary. A number of schools and barracks in Algeria were taken over for hospitals, and several of the general hospitals had to open up at once in tents. This involved a great deal of alteration and construction work for the Royal Engineers and Works Services. As time went on, a proportion of hutting was carried out for the tented hospitals.

The country was difficult. Much of it was mountainous, with narrow winding hill roads. Considerable stretches of plain intervened between the mountainous areas. The main roads were limited. There were two routes to the forward area—one inland through Setif, Constantine, and Souk Ahras to Beja and Medjez-el-Bab leading on to Tunis, the other along the coast through Bougie, Philippeville, and Bone. A certain number of cross-roads connected the two main routes.

The railway consisted of the main line through Setif and Constantine to Tunis. Branch lines ran from this to various places on the coast. The lines of communication were long and difficult; the distance from the main base at Algiers to the forward area was the best part of 500 miles by road.

In the winter months rain and mud made conditions extremely hard. The forward troops fighting in the hills, living in fox-holes and under any cover that could be found, had a gruelling time. The tented hospitals—until proper camp roads, concreted floors for operating theatres and tents, adequate

final phase included the capture of Bizerta by the Americans, the capture of Tunis by the First Army, the French, and some divisions of the Eighth Army, and the advance northwards of the main Eighth Army to the base of Cape Bon. The battle terminated with the round-up and surrender of the whole of the enemy forces on the Cape Bon peninsula.

One difference between the Middle East and the North African campaigns was that the operations in the Middle East started from a large peacetime organization, whereas in North Africa everything had to be brought by a long sea route

sanitary annexes, and cooking arrangements could be prepared—worked under most difficult conditions.

By the middle of Jan., 1943, the medical lay-out was as follows. The main base was at Algiers, with secondary bases on the coast at Bougie, Philippeville, and Bone. At each base there was an Assistant Director of Medical Services at area headquarters. Other areas and medical units were on the inland route on the lines of communication. The Director of Medical Services for the force and his staff, including the consultants and advisers, were located at Algiers. Four general

hospitals were established a few miles outside the town in buildings (an orphanage, a school, and barracks) and partly in tents. One unit was in an excellent sanatorium at Rivet, in the hills about 20 miles inland, with good operating theatres, x-ray department, and wards.

At Bougie one general hospital was in tents about four miles inland from the port. Near Philippeville one 1,200-bedded general hospital was in tents at Ste Jeanne d'Arc, a small seaside resort about four miles east of the town. A 600-bedded hospital was in process of opening alongside. These were excellent sites on sandy ground sloping down to within a few hundred yards of the sea. Another 1,200-bedded hospital and a Canadian general hospital came later to El Arrouch, about 20 miles inland, both in tents. Near Bone one 600-bedded general hospital was in tents about 15 miles inland from the town. A 200-bedded general hospital was at La Calle, near the coast some miles east of Bone. Inland, the headquarters of the lines of communication were at Setif; the Deputy Director of Medical Services for the Lines of Communication was here, and a field hospital (50 beds) was in buildings in the town. Further east, on the Setif plateau, a 600-bedded hospital was at Oued Athmenia, partly in a good building and partly in tents. Later a 1,200-bedded general hospital opened at Châteaudun. A field hospital (50 beds) was at Constantine; at Guelma, a few miles off the main road, a 600-bedded hospital was open in tents. The most forward of the 600-bedded general hospitals was at Souk Ahras, near the Tunisian border: this was partly in buildings and partly in tents. For a time one 200-bedded general hospital was at Biskra. The personnel and equipment of this unit were moved to the site entirely by air.

In the forward area the C.C.S.s, F.S.U.s, F.T.U.s, advance depots of medical stores, and the field ambulances were with the First Army from Sedjenane in the north, through Medjez-el-Bab, Beja, and Thibar, down to Bou Arada and Gafour in the south. The Medical Headquarters for the Army, the D.D.M.S., and his staff were at this time in the neighbourhood of Souk Ahras. One parachute field ambulance dropped very early in the campaign near Beja and carried out 136 operations there in the first few weeks.

Evacuation from the forward area was by road, rail, and air. By road, evacuation was by motor ambulance convoy through the general hospitals to (1) Philippeville, Guelma, and Bone, and (2) Souk Ahras and Oued Athmenia, to Algiers. Rail evacuation, to begin with, was slow and difficult. Ambulance trains were improvised from ordinary French rolling-stock, but by degrees corridor ambulance trains became available, and by May, 1943, nine of these were working. In the early stages of the campaign evacuation by air from the forward area was not practicable, but was carried out, in considerable numbers, from airfields on the lines of communication. A large airfield was sited near Oued Athmenia, and the general hospital there evacuated many cases in quite early days.

When forward airfields were established round Souk El Arba and Souk El Khemis, and air superiority had been obtained, more forward air evacuation became possible. Certain difficulties were encountered: low cloud over the hills and poor visibility often made flying impossible. The arrival of planes on a forward airfield is apt to be capricious, and it is not always certain to what destination the planes will return. To take patients 20 miles or so over indifferent roads, make them wait several hours on the airfield, and then have to take them back is not good treatment. Also, to have a holding medical unit at a forward airfield is not always possible. Therefore air evacuation, though often extremely valuable, has its limitations.

By May, 1943, the total American and British cases moved by air in the British North African Force were 16,500. The average distance was 300 miles. The average time of each journey was two hours. The British cases numbered 4,400 (surgical, 2,400; medical, 2,000). All types of surgical cases were taken except the following: (i) perforating chest wounds in the early stages; (ii) pneumothorax; (iii) severe shock associated with heavy loss of blood; (iv) intestinal wounds or disease. Evacuation to the United Kingdom was based on a 90-day policy; that is to say, those who would not be fit for duty in 90 days were evacuated from the force. Hospital

ships and carriers sailed only to and from Algiers, so that all cases for evacuation to England had to be collected at that port.

Field Surgical Units

The F.S.U.s were the War Office scale of personnel, equipment, and transport. They differed from the Middle East surgical units in that, in North Africa, the F.S.U.s had rather more equipment, including 20 hospital beds and a lighting set. The personnel and transport were on a slightly more generous scale. This was the first occasion these units had been mobilized for a field force. The Middle East had improvised their own. At this time there were no field dressing stations (F.D.S.s), which were the units designed to combine with the F.S.U.s to form an advanced operating centre. The F.S.U.s were therefore attached to C.C.S.s or the main dressing stations of field ambulances as their parent units. I think that many of the difficulties met with in those early days are overcome by the F.S.U.s when they are combined with their correct parent unit, the F.D.S.

As previously stated, the earlier months of the campaign were occupied in clearing the hills overlooking the Tunisian plain. During this period the C.C.S.s and F.S.U.s were comparatively static. When the general advance took place and the fighting became mobile these units were able to follow up behind the fighting troops. Concerning this latter phase there are some points of interest:

On account of the short distances it was possible to group C.C.S.s and F.S.U.s at points fairly close to the fighting line.* For example, at one time at Oued Zarga three C.C.S.s were grouped, each with two F.S.U.s and a field transfusion unit attached. These made an excellent operating centre 10 to 15 miles behind this portion of the front. Each C.C.S. admitted 100 casualties and then closed until 100 casualties had been admitted by each of the other two. In this way surgical teams could work with a reasonable time for sleep, meals, cleaning up theatres, and after-treatment of patients.

Three 600-bedded hospitals and three 200-bedded general hospitals had been allotted to the D.D.M.S. of the First Army. These were made "movable" and were also grouped. In the battle of Tunis one group of these was located at Thibar, about 20 miles behind the C.C.S.s and F.S.U.s. They admitted third-priority cases from the front and staged cases operated on at the advanced operating centre. This was made possible by a system of sectional packing of the hospital equipment and by the excellent work of the Royal Engineers and Works Services in providing a piped water-supply, sanitary annexes, concrete floors for operation tents, etc., all carried out within a very few days.

It was possible to spare an officer in charge of the surgical division of one of the newly arrived 1,200-bedded general hospitals, not yet open, to go round the C.C.S.s and F.S.U.s, work with them, and advise on operative technique and treatment generally. This was most useful, and is well worth arranging when possible, especially if some of the forward surgeons have not had much experience in dealing with battle casualties. Personal instruction and example are far more useful than all the paper one can send round. The officer in charge of the maxillo-facial unit had also been round advising the forward surgeons on the initial treatment of these cases.

An experienced operating ophthalmic surgeon was with the First Army. He had a lorry, a small technical staff, and optical equipment (lenses and frames), and toured the forward units and formations. In this way not only was skilled operating available as far forward as possible, but the replacement of lenses and spectacles was carried out in the most expeditious manner and a large amount of man-wastage saved. This was a forerunner of the mobile ophthalmic unit later created by the Consulting Ophthalmic Surgeon.

Team-work and Equipment

These units thoroughly justified their formation. They did excellent work throughout. The policy of bringing the surgeon to the wounded, within limits, is sound. Team-work is the

* Grouping of C.C.S.s was first carried out in 1915 at Remy Siding, where Nos. 10 and 17 C.C.S.s were located and alternate periods of duty were taken. This grouping of two and often three C.C.S.s then became routine.

essential. The unit must work as a whole and each man have his definite duties. The orderlies have more to do after the operating is finished, and tend to tire sooner than the surgeon. All need reasonable time off, sleep, and regular meals.

The equipment on the whole was adequate. General demands for certain items were put to the War Office and have been supplied. Heating is necessary for the theatre and wards in cold weather. Two Valor stoves were authorized for each F.S.U. in Tunisia.

A surgeon should not be kept with a forward unit too long. He must see at the base the results of forward surgery and thus complete his surgical education. I am of the opinion that a year is quite long enough for a surgeon to be with one of these forward units. If possible, a newcomer should work his way from a general hospital at a forward base, where he can observe the later conditions of wounds and see the reasons for advising certain lines of treatment and the various troubles and difficulties which may arise during the evacuation of casualties.

Location of Advanced Operating Centres

These should be as far forward as possible. This undoubtedly does help the morale of the troops; but they must be in a position where the severe cases, especially wounds of the abdomen, can be retained in reasonable safety and comfort for at least ten days after operation. After-treatment and good nursing are just as important as surgery. Early evacuation of these severe cases is disastrous. When it is possible to attach nursing sisters this is a great advantage.

Except in special circumstances, it is unwise to put a single surgical team forward with a field ambulance. One surgeon can cope with only a limited number of cases. The theatre staff do not finish when the operating is over, and they get more tired than even the surgeon. Also the nursing, after-treatment, and retention of the severe cases become more difficult.

[NOTE.—With reference to the location of advanced operating centres, it is of interest to recall an extract from a memorandum by the Consulting Surgeon to the Army after the last war:

"The conception of British surgeons is that no surgical operations of magnitude can be satisfactorily performed with a hope of a successful result if the patient has to be moved immediately after the operation. Consequently the arrangement is that, with a few exceptions, operation will be performed at the *casualty clearing stations*. These may be situated from 10 to 15 miles behind the actual fighting line; but experience has shown that, with modern motor ambulance transport, the extra time taken to get the wounded man a few miles further back than the main dressing stations of the field ambulance is only a fraction of the time spent in getting him from the place where he was wounded to the field ambulance. This extra time is well worth while to get the man to an area which will be more or less free from enemy fire, where more elaborate and permanent arrangements can be made for resuscitation, operation, and, more important still, where serious cases can be *retained for some days* at least and efficiently nursed before being evacuated further to the lines of communication or base.

"The policy of having operating areas *nearer* to the fighting lines was tried in the British Army, and was definitely found to be *unsatisfactory* even in the comparatively stable fighting line in France and Flanders.

"These advanced operating centres were primarily designed to deal with abdominal cases. In quiet times on the fighting front they did good work and undoubtedly saved lives, owing to the proved fact that early death in cases of abdominal wounds is primarily due to haemorrhage. In periods of heavy fighting they failed. The reasons for this failure are that an operating unit situated close up to the fighting line could only rarely be efficiently housed. Accommodation for more than one or two operating teams was difficult and shelter for patients bad.

"The time taken to operate satisfactorily on one abdominal case is usually about one hour, and it is easily seen that if 40 or 50 abdominal cases arrived at such a centre a long period would elapse before the majority of cases would reach the operating table. The wounded would have a much better opportunity of receiving surgical attention if they were evacuated by motor ambulance transport another 10 miles further back, where they would take their turn with a mixed class of case. In addition, the difficulties of providing efficient nursing and after-care, on which British surgeons lay great stress, and the possibility of early evacuation on account of enemy fire and pressure of cases, were

so much against the interests of the patient that this policy of operating arrangements close up to the fighting line is *not* now favoured."

On the clinical side it is proposed merely to refer shortly to points which were of interest so far as this force was concerned. Every opportunity was taken to make use of the experience gained by the surgeons in the Middle East, and their reports and surgical memoranda had been carefully studied. Copies of several of these had been sent to surgeons before the landings, and from time to time fresh memoranda on surgery were issued.

First-aid Treatment

This was generally of a high standard. The Thomas splint, usually with the metal boot-clip, was universally and correctly used. Tourniquets were rarely seen and rarely necessary. There was a tendency at times to overdo the injections of morphine. If patients passed through several posts they were sometimes found to have received as much as a grain of morphine by the time they arrived at the operating centre. Morphine is only very slowly absorbed in badly shocked patients. Men would also sometimes arrive with many cups of tea inside them.

Resuscitation

This was well provided for, and the field transfusion units did excellent work. The question of blood versus plasma has been much discussed. The experience of our surgeons was that cases with severe injuries could be restored to a reasonable condition with plasma, but that they would not then stand an operation of probably an hour's duration without blood. Blood will revive patients more quickly and enable them to stand the added trauma of operation much better than plasma alone. I consider that blood was neither wasted nor used excessively. It may be noted that, with the advances made in resuscitation, more of the very severely wounded become fit for operation than was possible in the last war. Worse risks come to the surgeon, and the actual post-operative mortality is probably higher, but certainly more lives are saved.

In attempting to forecast the numbers of patients who will require resuscitation various factors should be borne in mind. If the unit is dealing with first-priority cases a large proportion, probably over 50%, will require resuscitation; if with second and third priorities, there will be many fewer. The longer the time lag in the receipt of the cases, the more will require resuscitation. Local conditions, cold wet weather, a long journey over rough roads, will also have their effect.

Anaesthesia in the F.S.U.s and C.C.S.s

Apart from the use of ether for laparotomies and multiple wounds, most patients were anaesthetized with pentothal. The advantages of this drug are the rapidity of induction and the freedom from post-anaesthetic vomiting—a point of the greatest importance in the busy post-operative wards. Pentothal with oxygen was very satisfactory for the thoracic cases. Many of the anaesthetics in the C.C.S.s were given in a most competent manner by officers of the Army Dental Corps. The Oxford vaporizer proved a very satisfactory machine.

Types of Wounds

These varied greatly according to circumstances. Often the wounds were multiple. Mortars were much used, and were responsible for many of these. Mines caused many severe wounds of the feet and legs. It is essential to examine the whole of the patient, and extensive cleaning with soap and water and wide shaving should always be carried out.

Wound Treatment

Treatment was conducted on standard and accepted lines. In the early stages of the fighting one saw cases from which too much skin had been excised, a few attempts at primary suture, too tight packing of wounds, and insufficient division of deep fascia. This last was found especially necessary in wounds of the buttock, calf, and popliteal space. Attention was drawn to these points in surgical memoranda.

Extremities and Joints.—For transport during evacuation some form of the "Tobruk" plaster was universally used for the lower limb. Some surgeons developed slight modifications of their own.

The type generally used at this time was the encasing of the limb in plaster, with slits for the traction strapping and fixation of the limb to the Thomas splint with plaster bandages. The plasters were always padded and split. Details, with dates and simple diagrams, were well marked on the plaster, and proved most useful. For the upper extremity the "U" plaster, from the nape of the neck and including the forearm, was mostly used, and proved satisfactory. The immobilization of extensive soft-tissue wounds had been advised, but was perhaps not carried out as often as it might have been. Traction for wounds of the knee-joint was occasionally found to have been omitted. The usual faults in plaster work appeared from time to time: carrying the plaster beyond the proximal crease of the palm, so that stiffness of the metacarpo-phalangeal joints and fingers results; lack of instruction to the patients to move the fingers and toes continually; faulty position of the ankle and foot. These faults always seem to be cropping up, and need constant attention. The results are very difficult to correct.

Abdomen.—The treatment evolved in the Middle East was amply confirmed: suture, when possible, rather than resection; exteriorization and colostomy for wounds of the colon and rectum; gastric suction and intravenous therapy as a routine; and retention of cases for a minimum of ten days.

Chest.—Conservative surgery (wound excision and closure of the open pneumothorax), with early aspiration, was the rule, and proved satisfactory. Great relief of dyspnoea was noted after the early aspiration of haemothorax fluid. Many breathless shocked patients were greatly relieved by being propped up, and these cases travel better in ambulances and trains when so positioned. The advantage of treating the shock by the completely recumbent position does not compensate for the serious respiratory embarrassment caused. In only a few cases was full thoracotomy indicated in the forward area.

Head.—At the beginning there was some difference of opinion between the F.S.U. surgeons and the neurosurgeons as to whether the general surgeons should deal with these cases. It was pointed out that in the forward units the general surgeon had no special equipment for this type of work: diathermy was not available; x-ray examination was not always possible; and at the time there was only improvised suction. It was therefore accepted that it was better to get patients back to the neurosurgical unit with 48 hours if this was possible, for operation there. The sulphonamides—sulphadiazine when available—were always used.

Maxillo-facial Wounds.—As little as possible was done in the F.S.U.s and C.C.S.s beyond cleaning up, the arrest of haemorrhage, and fixation of the jaw, when necessary, by the dental officer. These cases were then transferred to the maxillo-facial unit.

Burns.—All coagulation treatment was forbidden as first aid. The routine was sulphanilamide and vaselined-gauze dressing. It was confirmed that cases of severe burns travel badly during the first five or six days after injury.

Septic Sores.—During the hot weather there was much man-wastage from sores on the exposed areas of the knee, elbow, and forearm regions. Often quite trivial in origin, they became chronic and resistant to treatment if neglected, and frequently meant weeks in hospital. There seemed to be no panacea for them. Unit medical officers were asked to get men with even minor skin abrasions, thorn-pricks, etc., to report sick at once so that they could obtain early treatment.

Whitlows.—It was found necessary to issue an instruction that only the most minor conditions should be treated by unit medical officers. Much time and many bad results are saved by early admission to hospital. Too many midline and inadequate incisions under ethyl chloride were seen in the early stages of the campaign.

Chemotherapy.—It was impressed on all that the sulphonamides are not a substitute for early surgery. These drugs were used prophylactically and therapeutically. To begin with, oral doses at four-hourly intervals had been advised for all wounded. In practice this broke down on the long lines of communication, and the Middle East sulphanilamide label, with the two doses at 8 a.m. and 6 p.m., was adopted. Owing to the universal use of these drugs, both orally and locally, it was impossible to evaluate their effect. The general impression was that they were of value in retarding the onset of infection. Also, as compared with the last war, the appearance and general condition of the men in the base hospitals seemed better. Although many wounds were infected the patients did not look so toxic and ill. Sulphanilamide, sulphathiazole, and sulphapyridine were the forms mainly in use for surgical cases. Some sulphadiazine was obtained latterly. Penicillin was not available in this campaign. The Penicillin Unit arrived in North Africa in May, 1943, and began investigations in one of the Algiers hospitals.

Anaerobic Infections.—**Tetanus:** Up to May, 1943, one case of generalized tetanus occurred in a German prisoner-of-war and one case of local tetanus in a British soldier. Both recovered. **Gas gangrene:** It is regretted that actual figures are not available. Up to May, 1943, there had been under 100 cases. Treatment was by early surgery, large doses of serum, and the sulphonamides.

Some Statistics

(a) The number of battle casualties operated on in 12 F.S.U.s and 6 C.C.S.s between Nov., 1942, and May 15, 1943, was:—total operations, 8,881: deaths, 331; mortality, 3.72%. It is interesting to compare these with some figures from the last war. On the Somme in July, 1916, 13 C.C.S.s of the Fourth Army dealt with 14,400 casualties on the first day, 13,306 on the second day, and 8,793 on the third day. The surgical staff of the C.C.S.s had, of course, been reinforced by a considerable number of surgical teams.

(b) Figures from four general hospitals in Algiers for the period Nov., 1942, to Sept., 1943 (wounds of the abdomen, chest, and head), were:

	Total	To Duty	To Conv. Depot	Trans. to Other Hosp.	To U.K.	Died	Remaining	Mortality
Wounds of abdomen	287	77	54	14	129	8	5	2.7%
Wounds of chest	599	147	127	72	221	5	27	0.8%
Wounds of head	420	129	52	43	170	9	17	2.1%

Acknowledgments are gratefully made to the D.M.S. of the British North African Force, Allied Force Headquarters, Major-Gen. Sir E. M. Cowell, and to the D.D.M.S., First Army, Brig. E. W. Wade, for their courtesy and help. Also to Brig. N. Cantlie, D.D.M.S., 5th Corps, for his unfailing interest in the surgical arrangements and the time he gave up to taking me round on all my visits to his area.

INVESTIGATION AND TREATMENT OF ENURESIS IN THE ARMY

PRELIMINARY REPORT ON 277 CASES*

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As the result of considerable success in the out-patient treatment, since the outbreak of war, of nocturnal enuresis in soldiers by explanation, education, and suggestion, a fuller investigation of the problem has been undertaken in hospital. The findings and results of treatment presented below are based on the clinical examination and treatment of 277 unselected cases of nocturnal enuresis consecutively admitted to a military (psychiatric) hospital during the eight months ending Sept., 1943.

Examination

A full physical examination by the medical specialist was made at the time of admission. Special examinations were done on 232 cases as follows:

Bladder-function-test Cystometry.—With due preparation and without local anaesthesia, a No. 8 E soft rubber catheter was passed into the bladder. The resistance to its passage was recorded by an arbitrary standard: $\pm$ indicated practically no resistance; $++$, strong resistance. The bladder was emptied and boric acid solution at a temperature of approximately 100° F. was allowed to flow into it at a pressure of 20 cm. of water. The base-line was taken as 1 cm. below the level of the pubic arch as the patient lay on the table. The apparatus used was a simple graduated glass container held on an adjustable stand. Fixed levels were maintained by moving the head of the stand up and down. A pressure of 20 cm. was chosen, as being just above that required to bring about an initial stimulus to micturate. This was confirmed by our preliminary tests and is quoted by standard works on physiology: "18 cm." (Sampson Wright, 1940). At this level of pressure, flow was allowed to continue until the patient, having been previously warned, intimated a desire to micturate, when the flow was immediately stopped. A volume reading was taken (see Table I). The patient was then encouraged to relax the bladder by increased control of the external sphincter muscles and an endeavour to create a negative pressure

* A paper read at a meeting of Army psychiatrists held at York in July, 1943.