polyvalent antitoxin, given intramuscularly to casualties considered prone to gas gangrene—i.e., those with severe wounds of the buttock, thigh, or shoulder, with compound fractures of the femur, or with penetrating wounds in which primary surgical treatment had been delayed more than 24 hours. From personal observations and from a knowledge of the amount of antitoxin used, we feel confident that these instructions were conscientiously carried out.

Between 13 and 14% of all battle casualties received prophylactic antitoxin. This figure, which is rather higher than had been anticipated, is based on an analysis of the operation books and records of nine surgeons who were working in the forward areas throughout the period in question, and involves 2,438 entries. There is no reliable information concerning the average time between wounding and the administration of the antitoxin, but since antitoxin was never given in front of the forward surgical centres, some estimate can be made on the basis of the average operative delay. The limiting times in the present series were $5\frac{1}{2}$ hours and 3 days 6 hours, but the great majority of the patients were first seen by the surgeon in the 12–24 hours period after wounding. From a single run of 256 casualties admitted in a 36-hours period to one C.C.S., 26 received prophylactic antitoxin at an average time of 20 hours after wounding, and this is probably a very fair figure for the entire campaign.

It was not possible, in field conditions, to obtain the data which would show whether the administration of antitoxin had reduced the incidence of gas gangrene among those who were most likely to develop it, but one very interesting fact was observed. Full details are available concerning 75 out of the 78 cases occurring in the Eighth Army between Sept. 1 and Dec. 31, 1943. In 34 patients who received prophylactic antitoxin the mean incubation period of the disease was 68 hours; in 41 patients who had not received antitoxin (presumably because they were not considered likely to develop gas gangrene) the mean incubation period was 33 hours. This marked increase in the incubation time of the disease in the patients who had received antitoxin is at least indicative of the value of prophylaxis, particularly in view of the delay in administration: it may be recalled that the decrease in the incidence of tetanus upon the introduction of prophylactic tetanus antitoxin was accompanied by an increase in the incubation time in those who developed the disease.

Summary

Cases of gas gangrene occurring in the Central Mediterranean Force between July, 1943, and February, 1944, have been studied both in the field and by an analysis of Army Form I 1241.

The fatality rate, which was high in Sicily and in the early part of the campaign, fell sharply in December, 1943. It has been shown that this fall was coincident with an improvement in the general standard of treatment.

The case-fatality rate was lowest among those who received within 6 hours of diagnosis both surgical treatment and an intravenous dose of at least 50,000 units of polyvalent antitoxin.

Some evidence indicative of the value of antitoxin as a prophylactic has been presented.

Thanks are due to the D.G., A.M.S., for access to the case reports, to D.D.M.S. and Consulting Surgeon, Eighth Army, for the granting of facilities for the field investigation, and to Dr. E. Lewis-Fanning for his help with the analyses.

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R. C. Murphy (*New Engl. J. Med.*, 1944, 250, 69) records a case of Stevens-Johnson's disease—an eruptive fever involving the mouth and eyes, described in 1922. It is characterized by an acute, sometimes fulminating, onset with fever and prostration, erythematous generalized rash, and severe stomatitis followed by sloughing. With occasional exceptions the conjunctivae are involved. The usual period until resolution of the skin lesions is about three weeks. Nothing has been revealed by laboratory examination. The age limits are 22 months to 16 years. With rare exceptions the disease is confined to male children.

FRACTURE OF THE CARPAL SCAPHOID

BY

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In the practice of the fracture clinic at a Royal Naval hospital during two and a half years of war we have been impressed by the frequency of fracture of the carpal scaphoid in the young healthy adult male. This article is an analysis of our experience of this lesion. We also make a very strong plea for the recognition of this important drain on man-power. By early diagnosis and adequate treatment prolonged disability can be avoided and many useful men returned to duty who otherwise would waste many months in invalidism. Wilson states that 86% of carpal injuries involve the scaphoid. Hook and Boone (1936), of the United States Naval Service, in their analysis quote figures of one in ten compared with other carpal injuries. Unfortunately most recorded figures do not state the types of lesion included. Our own series includes only fractured scaphoids and Colles fractures.

In the period under review there have been treated at this hospital 100 fractured scaphoids, compared with 58 Colles fractures. The patients have all been sailors or airmen between the ages of 17 and 50, the average age being 27 years. Many of these men had received an injury at sea or on an isolated station with no facilities for radiological examination. We would urge that had they all been treated as possible fractures from the start and been immobilized, much loss of valuable time would have been avoided.

Aetiology

Scaphoid fracture has almost always been caused by a fall on the outstretched hand or a forced and unguarded dorsiflexion of the wrist. A number of cases have come to our notice with a history of recent injury but with the radiological findings of an old ununited fracture of the scaphoid. These men had been able to carry on for years with no other symptoms than a slight weakness of the wrist. It is considered that the real cause of their disability is the lighting-up of osteo-arthritis consequent on their original injury, rather than on the fracture *per se*.

Symptoms and Signs

These may be no more than a "sprain" of the wrist, and herein lies the potential danger of overlooking a fracture. It is a platitude, for the repetition of which no apology is given, that all sprains should be x-rayed if possible and all doubtful cases treated as fractures.

The nearest approach to classical signs of scaphoid injury are pain, tenderness, and swelling in the "anatomical snuff-box." Another sign sometimes obtained is pain on percussion of the tip of the thumb held in extension. In the presence of these signs, even if the radiological findings are negative, nothing is lost by immobilization for a fortnight in plaster-of-Paris. Radiological examination at the end of this time will clearly demonstrate a fracture if present, and a very valuable fortnight of immobilization will have been gained.

Radiology

These fractures can be extremely difficult to demonstrate, especially in the early stages. It is our practice to take four views of the bone—i.e., antero-posterior, lateral, and the two obliques. The commonest site of injury is across the waist of the bone, and it is here that a most careful search must be made.

The earliest lesion may show only a "hair-line" crack. This can sometimes be made more obvious by forced ulnar deviation of the wrist, which tends to open the crack in the scaphoid by the pull of the medial collateral ligament. After ten days the crack may become more obvious owing to the physiological hyperaemia of repair producing osteoporosis. Herein lies the importance of a later radiograph in doubtful cases of sprain. This osteoporosis may in a small number of cases progress to

a cystic appearance in the middle of the bone (Fig. 1), and should be completely reossified before union can be considered secure. It should not be mistaken for a similar cystic appearance throughout the bone which is sometimes seen in men who use traumatizing tools—e.g., pneumatic road drills or

FIG. 1.—Typical cystic appearance sometimes seen in the fracture line during the process of repair, due to hyperaemic decalcification.

FIG. 2.—Multiple carpal cysts with pathological fracture of right carpal scaphoid. Patient a dockyard worker who had used a small pneumatic drill over a long period. Drill required support of right hand only. No bony abnormality of left carpal bones.

riveting machines (Fig. 2). A less common and not so important injury, demonstrated radiologically, is a separation of the tubercle of the scaphoid.

In cases with delayed union varying degrees of avascular necrosis of the fragments, sclerosis of the fracture edges, and osteo-arthritis will be demonstrated. This necrosis must not be confused with the osteoporosis of the proximal fragment compared with the osteoporosis of the more richly vascularized distal portion of the bone that is sometimes seen. This imbalance is noted chiefly at about the second month, and tends to be restored as healing proceeds. In cases in which union has been long delayed this avascularity may persist and remain, with consequent destruction of the articular cartilage and the laying of the foundations of osteo-arthritis.

Treatment

It has been our practice to immobilize in plaster-of-Paris all cases of suspected scaphoid injury. This routine is carried out in both the early and the late cases, whatever the radiological findings may be. By adopting this measure early cases are not overlooked, and those late cases that will unite with immobilization are given a chance of doing so. As stressed by Watson-Jones, this immobilization must be adequate and continuous, and be prolonged until either complete union has taken place or non-union has become established.

The type of cast used is an unpadded plaster from the upper forearm to the metacarpal heads. Slight dorsiflexion,

with the thumb in line with the long axis of the radius and slight radial deviation, is the position of choice (Fig. 3). For a period we exaggerated these positions, as recommended by Buxton, but found that thereby the discomfort of the patient was considerably increased without there being a corresponding improvement in healing-time. The first metacarpo-phalangeal joint is immobilized, and on the palmar surface the plaster is brought only to the proximal crease in order to allow full flexion of the fingers. Care is taken to mould well into the palm to ensure no movement in the carpus.

At this point we would stress the importance of impressing on patients the need for *continuous* immobilization. The least crack or weakening of the plaster must be at once reported and put right.

FIG. 3.—Type of cast and position of thumb.

Results

Of our cases 52 were diagnosed and treated within seven days of injury, and all of them had clinical and radiological union, with an average period of immobilization of 11.16 weeks (Table I). All cases were checked by further radiological examination a fortnight after removal of the plaster.

TABLE I.—Results of Plaster Treatment

	No. of Cases	Union	Non-union
Treated within 7 days of injury	52	52	
United plaster-of-Paris only; average time, 11.16 weeks			
Treated after 7 days of injury	48	13	
United plaster-of-Paris only; average time, 26 weeks			
Ununited:			
Severe osteo-arthritis and invalided			2
No osteo-arthritis and sent to duty			3
Slight osteo-arthritis and sent to light duty			12
Operation and duty or light duty			8
Operation and invalided			3
Operation disposal unknown			1
Final state and disposal unknown			6
	100	65	35

Of the remaining 48 cases—all of which were seen at periods ranging from one week to several months or even years after injury—a further 13 united with plaster only, but with an average immobilization period of 26 weeks. The longest period of immobilization resulting in union was 60 weeks. Patience in this case was indeed a virtue well rewarded. Established non-union occurred in 29 of these late cases. By this we mean radiological separation of the fragments with marked sclerosis of the fracture edges (Fig. 4). This may often be associated with avascular necrosis of the proximal fragment. Of these cases, two were discharged from the Service as unfit for any further work involving the wrist. Details of these two cases are given to show the lamentable story which may follow a missed diagnosis of this very amenable lesion.

Case 1.—This patient, aged 41, was diagnosed as having a fractured scaphoid five months after injury. Two and a half years' immobilization in plaster was employed, during which three unsuccessful bone-graft operations were performed at an E.M.S. orthopaedic hospital. Advanced osteo-arthritis and severe disability resulted.

Case 2.—The patient, aged 37, was first seen five years after injury. There was then a good deal of sclerosis, and non-union had resulted. The wrist was immobilized for 40 weeks with no improvement, and osteo-arthritis and severe disability resulted.

In three cases of non-union the men were discharged to full duty. These were all late cases, but had been fortunate in having a good range of movement and no osteo-arthritic

FIG. 4.—Established non-union with marked sclerosis of both fragments and early osteo-arthritic change.

changes. In 12 cases of established non-union which had no other treatment than prolonged immobilization the men were discharged to light duty. Most of these cases showed some degree of osteo-arthritis and disability of the wrist: these patients were all men who were especially valuable to the Service by reason of technical knowledge and experience.

Twelve cases of non-union received operative treatment. These operations were performed at various hospitals; the results are set out in Table II. It will be noted that union was obtained in a further five of these cases; two had osteo-arthritic changes. Three of the five returned to duty; one was invalided owing to the severity of the disability; and the disposal of the fifth is unknown. The two cases of excision of the proximal fragment developed osteo-arthritis, but were fit for further service. Of the remaining five, two had to be invalided with non-union and arthritis and three went to light duty with non-union and arthritis.

TABLE II.—12 Operation Cases

Type of Operation	No.	Total Treatment Period	Result	Osteo-arthritis	Disposal
Bone graft	3	(i) 32 weeks	Union	Absent	Duty
		(ii) 40 "	Non-union	Present	Invalided from Service
		(iii) 52 "		"	
Excision of proximal fragment	2	(i) 20 weeks		"	Duty
		(ii) Not known			
Drilling	7	(i) 32 weeks	Non-union	"	Light duty
		(ii) Not known	"	"	Invalided
		(iii) 36 weeks	Union	Absent	Duty
		(iv) 68 "	"	Present	Invalided
		(v) 16 "	Non-union	"	Light duty
		(vi) 16 "	Union	Absent	Not known
		(vii) 20 "	Non-union	Present	Light duty

Thus it is shown that operative treatment is essentially a last resort and the results may be disappointing. The chief reason for this is the apparent inevitability of osteo-arthritic changes.

The records of the remaining six cases of the series cannot be traced, and they are included only to show the relative frequency of the scaphoid lesion in wrist-joint injuries.

TABLE III.—Final Results in the Series of 100 Cases

	United	Disposal:	Cases
	..	..	71
Resumed full duty	..	..	72
Resumed light duty	..	..	16
Invalided	..	..	5
Final disposal unknown	..	..	7

Multiple Carpal Fractures associated with Fractured Scaphoid

Two cases were associated with Colles's fracture of the lower end of the radius. There was one case of bilateral fracture of the scaphoid caused by falling backwards on to both wrists. One united in three and the other in four months. There was one case of fracture of the tubercle of the scaphoid together with fracture of the os magnum. Sound union occurred in nine weeks. One case of fracture of the body of the scaphoid occurred together with fracture of the trapezium and trapezoid. Prolonged immobilization was unsuccessful, and osteo-arthritis of the carpus resulted. One fractured scaphoid tubercle was associated with a Bennett's fracture, and both united in six weeks.

An unusual case was seen in a man aged 35 whose case was diagnosed one week after injury as a fracture of the waist of the scaphoid. After three months' immobilization union had taken place. He continued to have a painful wrist, and two months later developed a cold abscess in the region of the scaphoid. This was aspirated and proved to be tuberculous. There were radiological findings of tuberculous disease of the scaphoid, and he was transferred to an E.M.S. hospital for further treatment.

Summary

An analysis of 100 cases of fractured scaphoid in a continuous series of 158 wrist-joint injuries is given.

The importance of not overlooking injury to the carpal scaphoid in young adults with "sprained wrist" is stressed.

The value of early and adequate plaster-of-Paris immobilization is proved, and a plea is urged for early plaster even in the absence of radiological facilities or positive diagnosis.

Operation in a small number of late cases may preserve some utility in the affected wrist.

We wish to thank Surg. Rear-Admiral Twigg for kind permission to publish this paper. We are also very grateful to Miss Irene Lindsay, V.A.D., for invaluable assistance in collecting and compiling our records, and are indebted to Surg. Cmdr. Pankridge for his assistance with the radiology.

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EPIDEMIC INFECTIVE HEPATITIS IN GLOUCESTERSHIRE

BY

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Although infective hepatitis is not at present a notifiable disease, as many as 246 cases were reported in Gloucestershire during 1943. Most of these occurred in children attending elementary schools, the remainder in children in residential nurseries; and the behaviour of the disease was so different in the two types of community that it seemed worth recording. It is hoped that the outbreaks in residential nurseries will be of some epidemiological interest, since children and staff seem to make, so far as is practicable, a closed-herd community. Lisney (1937) and Newman (1942) have described outbreaks in schools, and Evans (1942) and Hallgren (1942) have recorded outbreaks in institutions which are practically closed communities.

Observations

(a) Elementary Schools

From elementary schools with a total attendance of 40,000 the number of cases of infective hepatitis reported during the