

(1943) reports a transient hemiplegia in a case of ligation of the common carotid and jugular vein which (owing to the onset of pneumonia) had to be sat up 48 hours after operation. The jugular vein was not tied in any of the three cases done at this hospital. Facilities for arterial suture are seldom available in forward hospitals and most war wounds are not suitable for this procedure. The value of large and repeated transfusions is well illustrated by cases 12 and 13.

Infected cervical wounds heal rapidly by granulation if laid wide open; the resultant scars contract considerably, often leaving very little deformity. If the wounds are closed, however, even with drainage, loculation of infection may take place, and suppuration, with its attendant danger of secondary hæmorrhage, may continue for a long time.

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COMPARATIVE EFFECTS OF SULPHONAMIDE DRUGS IN MILD BACILLARY DYSENTERY

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THAT sulphonamide drugs have a beneficial effect in bacillary dysentery is now generally accepted, although convincing statistical evidence is not yet available. Sulphaguanidine is commonly regarded as the drug of choice, because it is relatively poorly absorbed from the gut, reaching a high concentration in the intestinal lumen without a correspondingly high blood-concentration and thus having little tendency to cause systemic toxic effects. Its action in bacillary dysentery in the Middle East (ME) has been the subject of favourable reports by Fairley and Boyd (1942) and Bulmer and Priest (1943); the latter refer to it as "a specific drug in the treatment of acute, subacute and chronic bacillary dysentery." Other authors have claimed striking results with sulphapyridine (Reitler and Marberg 1941; Masefield 1941, Paulley 1942, Swyer 1943), and Paulley suggested that it has advantages over sulphaguanidine. Sulphathiazole has also been used with apparent success. In discussion with other physicians in ME, I have found a difference of opinion about the efficacy of sulphanilamide in dysentery; Bulmer and Priest (1943) state that "sulphanilamide in the form of crushed tablets does not have any definite effect in the disease."

This paper records observations during the summer of 1943 at a large desert base hospital in ME on the relative efficacy of sulphaguanidine, sulphapyridine and sulphanilamide. Interest in this problem was aroused by an experience at the beginning of the dysentery season. Supplies of sulphaguanidine being temporarily sufficient only for severe cases, in an officers' ward sulphanilamide in rather heavy doses for 48 hours was tried as a routine treatment with results which seemed comparable with those previously obtained with sulphaguanidine. This led to an attempt, in one of the dysentery wards, to estimate the relative efficacy of such sulphonamide drugs as were readily available at that time—which unfortunately did not include sulphathiazole. The evidence for a beneficial action by sulphonamides seemed so good that it was not considered justifiable in a military hospital, whose prime function is to return men to duty as rapidly as possible, to include a control group of untreated cases.

MATERIAL AND METHOD

The clinical material studied falls into two groups.

Group 1.—Patients in an "other ranks" dysentery ward, from June 10 to Nov. 6, 1943. At first it was ruled that any severely ill patients were to be treated on the orthodox lines with sulphaguanidine in the current dosage; but during the entire period only 15 were so treated, and on subsequent analysis these cases were found to be no more severe than the average. It may therefore be assumed that the cases studied represented a fair sample of the dysenteries treated at the hospital during the summer of 1943. With the above-mentioned proviso, all patients admitted to the ward with blood and mucus and a dysenteric exudate in the stools were

to be treated in rotation with one of three suspensions in doses of 3 oz. and then 1 oz. three-hourly for 48 hours. These three suspensions contained in each ounce:

1. Sulphaguanidine 2.5 grammes	} total dose in 48 hours	{ 47.5 grammes 19.0 19.0
2. Sulphapyridine 1.0 gramme		
3. Sulphanilamide 1.0 "		

Three-hourly dosage was adopted because it was thought that this might maintain the concentration of the more soluble drugs at a more constant level; and the composition of the sulphaguanidine suspension was adjusted to approximate the total dosage with three-hourly administration to that attained with the customary dosage of 7.0 g. followed by 3.5 g. four-hourly.

Group 2.—The sulphanilamide-treated patients in the officers' ward, mentioned above, with an additional sulphaguanidine-treated group. During 6 weeks in May and June, 1943, all acute dysentery patients in this ward were treated with sulphanilamide in the above-mentioned dosage (19 g. in 48 hours). After the middle of June, routine treatment in this ward was changed to sulphaguanidine in doses adjusted to the clinical course of the case, giving a comparable series of sulphaguanidine-treated cases. Dosage of sulphaguanidine in this series varied from 17.5 g. in 1 day to 108 g. in 6 days, with a mean of 58 g. in 3.2 days. Three very severe cases admitted while sulphaguanidine was being used are omitted from the analysis.

The type of dysentery current at that time was mild: during the observation period 1400 cases, all direct local admissions, were treated in the hospital, and there was no death from dysentery. Routine culture of dysenteric stools was discontinued early in the summer, so for most of the cases observed only information about the cytology of the stools is available. "Bacillary exudate" indicates an inflammatory exudate containing over 50% of polymorphonuclear neutrophils, and "indefinite exudate" indicates an exudate containing 50% or less of these cells.

In the 34 group 2 cases which were treated (with sulphanilamide) before routine culture was discontinued the incidence of positive cultures was 47%, as follows:

Dysentery bacilli isolated	No.	%
Varieties: Shiga	16	47
Sonne	6	17
Flexner	4	12
Unidentified non-mannite-fermenter	3	9
	3	9

In both groups records were kept which would enable a more or less objective estimate of relative severity and of response to treatment to be made. These are analysed in the table. All cases treated within 5 days of the onset (with the exceptions noted above) are included. Apart from the sulphonamides, treatment consisted in rest in bed, ample fluids, and a bland diet adapted to the patient's condition as it improved.

DISCUSSION

Total number of cases.—It will be noted that, despite the intention to treat equal numbers of cases in group 1 with the three drugs, more were treated with sulphaguanidine than with the other two. One reason is that the suspensions were lettered A, B and C, and there was a tendency to treat the first patient of each day's admissions with suspension A. The medical officer in charge of the ward changed several times during the observations, and it is possible that the observed absence of side-effects with this suspension may have influenced officers not completely familiar with the routine to use this suspension rather more than the others.

Severity.—The suggested criteria of the severity of each group are:

- (1) Relative proportions of BE and IE cases.
- (2) Duration of diarrhoea before admission.
- (3) Number of stools in the 24 hours before admission.
- (4) Incidence of pyrexia.

Maximal pyrexia was generally present on admission or soon afterwards, and thus is mainly an indication of severity. The duration of pyrexia after admission should be expected to be influenced by treatment, and is therefore more difficult to interpret. Judged by these criteria, groups 1 and 2 each seem as homogeneous as one can expect clinical material to be.

ANALYSIS OF CASES

	Group 1 June-Nov.			Group 2		
	Sulpha- guanidine 47.5 g. in 48 hr.	Sulpha- pyridine 19 g. in 48 hr.	Sulpha- nil- amide 19 g. in 48 hr.	Sulpha- gani- dine July- Nov. Varying dosage	Sulpha- nil- amide May- June 19 g. in 48 hr.	
Cases—Total ..	117	76	81	50	34	
Bacillary exudate * ..	83 (71)	60 (79)	59 (73)	37 (74)	27 (79)	
Indefinite exudate † ..	34 (29)	16 (21)	22 (27)	13 (26)	7 (21)	
<i>Severity—</i>						
Av. duration be- fore admiss. (days) ..	2.0	2.2	2.2	3.5	2.7	
Av. no. of stools in day before admiss. ..	14	14	13	13	15	
Febrile % ..	73	64	65	60	71	
Av. max. Feb- re recorded	All cases	100.0	99.6	99.9	100.1	100.3
	Feb- rile cases	100.5	100.2	100.7	101.2	101.0
Av. dur. after admiss. (days)	1.2	1.3	1.7	1.3	1.5	
<i>Results—</i>						
Av. day after admiss. on which stool- first formed ..	4.8	4.1	4.4	5.0	4.6	
Av. days in hospital ..	11.2	9.3	9.9	10.5	8.7	
Cases given fur- ther treatment	11	1	3	..	nil	
Complications of treatment ..	nil	Vomiting 4; hæma- turia 1	nil	nil	Rash 1	

Percentages in parentheses.

* Bacillary exudate. Contains more than 50% of polymorpho-nuclear neutrophils.
† Indefinite exudate. Contains less than 50% of polymorpho-nuclear neutrophils.

Results of treatment were judged by: (a) the day on which the stools were first observed to be formed; and (b) the total duration of stay in hospital. The criterion for discharge from hospital was three successive formed stools free from mucus. In computing for the table the averages of duration of stay, a few cases in which it was prolonged by supervention of another disease have been omitted. It will be seen that in group 1 the stools were first formed after an average of 4.8 days in sulpha-guanidine-treated cases, 4.1 days in sulphapyridine-treated cases and 4.4 days in sulphanilamide-treated cases; and the corresponding figures for duration of stay in hospital were 11.2, 9.3 and 9.9 days. In group 2 the sulphaguanidine-treated cases had formed stools in an average of 5 days and were in hospital for an average of 10.5 days, while the corresponding figures for sulphanilamide were 4.6 and 8.7. These figures suggest that in the mild type of dysentery treated there is no significant difference in the therapeutic effect of sulpha-guanidine, sulphapyridine and sulphanilamide in the doses used.

It will be seen that in group 1 further treatment was required after the standard course had been completed in 11 sulphaguanidine-treated cases but in only 1 sulpha-pyridine-treated and 3 sulphanilamide-treated cases. And in group 2 no sulphanilamide-treated case required further specific treatment after the routine 48-hour course, while treatment with sulphaguanidine was some-times prolonged to 5 or even 6 days. Bulmer and Priest (1943) stress the liability to relapse if sulphaguanidine is stopped too soon. It is noteworthy that further specific treatment was often desirable after the limited routine course of sulphaguanidine given in the present series, and that further treatment was seldom con-sidered necessary after the limited heavy courses of sulphapyridine and sulphanilamide. Paulley (1942)

also found less tendency to recrudescence in sulpha-pyridine-treated than in sulphaguanidine-treated cases.

Complications.—It is in the low incidence of untoward side-effects that sulphaguanidine shows its greatest advantage over the other sulphonamide drugs in the treatment of dysentery. No complications were observed in the sulphaguanidine-treated cases in this series; and the only complications of the use of this drug which have been observed at this hospital—all after enormous dosage—are a scarlatiniform rash and the three cases of toxic psychosis reported by Crofton and Diggle (1944).

In the sulphapyridine-treated cases vomiting was troublesome enough to interfere with treatment in 4, and others had annoying nausea; slight cyanosis was not uncommon; and there was 1 case of hæmaturia and anuria, which cleared up completely after ureteric catheterisation. Quite a high proportion of sulphanil-amide-treated patients became obviously cyanosed, some strikingly so; but the cyanosis rapidly disappeared after treatment was completed and seemed to be of no practical importance. One sulphanilamide-treated patient developed a transient morbilliform rash. Apart from these, no untoward effects from sulphanilamide were observed.

SOME SEVERE CASES

While the clinical impression that sulphaguanidine has a beneficial effect in severe bacillary dysentery is strong, its action is not, in my opinion, as specific as that of sulphapyridine or sulphathiazole in pneumococcal infections. In a not inconsiderable number of severe cases the response to sulphaguanidine has proved dis-appointing, frequent small stools of blood and mucus, pain and fever persisting after long courses of 150 g. or more. In these cases treatment on general lines—maintenance of fluid intake and of nutrition as far as possible with a high-protein, high-carbohydrate, easily assimilated diet containing sufficient vitamins and blood-transfusion where necessary—has been at least as important as the administration of sulphaguanidine. And in severe Shiga infections there is no doubt of the great value of concentrated antitoxic serum. In several severe cases (not included in the present series), after long courses of sulphaguanidine had brought no dramatic improvement, I have given sulphanilamide or sulpha-thiazole 19 g. in 48 hours (after the usual precautionary blood-count), and I have gained the impression that improvement has followed frequently and dramatically enough to be attributed to the action of these drugs. Paulley (1942) suggests that in dysentery the concentra-tion of sulphonamides in the lumen of the bowel may not really be so much more important than their con-centration in the blood. Certainly in long-continued severe cases, where the colonic mucosa may be grossly thickened and partly converted into highly vascular granulation tissue oozing pus, attack from the blood-stream seems reasonable, even though the habitat of the primarily causal bacilli is known to be the lumen of the bowel.

CONCLUSIONS

From the data presented there are two possible con-clusions. The first is that in the mild type of dysentery treated, none of the three drugs has any specific effect. Clinical impressions and the published experience of others are against this view. The alternative conclusion is that sulphanilamide, sulphapyridine and sulpha-guanidine in adequate doses are equally beneficial in mild bacillary dysentery. The only advantage of sulpha-guanidine, which has made it the drug of choice, is that it hardly ever has unpleasant side-effects. The grave defect of sulphapyridine is its liability to cause serious renal disorders—a special danger in a dehydrating disease though with adequate care about water intake by one route or another this danger should be avoidable. A lesser defect is that it is apt to cause nausea and vomit-ing. Sulphanilamide in this series had no serious side-effects, and its therapeutic possibilities in bacillary dysentery seem to have been unduly neglected.

SUMMARY

The relative therapeutic effects of sulphaguanidine, sulphapyridine and sulphanilamide have been investigated by observations on 358 cases of mild bacillary dysentery.

These three drugs were equally efficacious, and the only advantage of sulphaguanidine was that it very seldom caused unfavourable side-effects.

I am indebted to the medical officers and sisters at various times in charge of the ward in which the patients in group 1 were treated, for their coöperation; and to Major John Dick, RAMC, for the laboratory data.

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TREATMENT OF FRACTURES OF THE FEMORAL AND TIBIAL SHAFTS IN THE SAME LIMB

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SURGEONS TO AN ORTHOPÆDIC UNIT, EMS

SURGEONS with experience of treating fractures have usually well-defined views on the treatment of the more common injuries. Guidance in the management of the rarer fractures is given adequately in a number of textbooks. In cases, however, where treatment is complicated by multiple associated injuries this guidance is often lacking, because few surgeons have enough experience of the less common combinations of lesions to give instruction in their treatment; nor can much assistance be obtained from the literature.

In some cases the association of multiple fractures is so common as almost to be thought typical of some particular injury; and sometimes, as in the combination of fractures of the os calcis and lumbar spine, treatment of the one injury is not seriously affected by the presence of the other. When, however, the injuries are in the same limb their association may present difficult problems. The treatment of two such fractures is very much more than twice as difficult as that of either alone.

We propose here to deal with the combination of fractures of the shaft of the femur and of the tibia and fibula in the same limb. We have had the advantage of obtaining the records from another EMS orthopædic unit and have studied these with the records of cases under our care. Of 200 fractures of the shaft of the femur, 16 had an associated tibial shaft fracture on the same side.

The table will give some idea of the difficulties and of the comparatively unsatisfactory results of treatment. Amputation was required in 3 cases; in only 3 did the ultimate knee range exceed 90°; and the time required for union of either fracture was much longer than the average for uncomplicated cases.

FOUR PRINCIPLES

The aim of any fracture treatment must be the fullest possible restoration of function. Four general principles may be outlined.

1. The most important aim in the treatment of a fracture of the shaft of the femur is that there shall be a useful range of movement at the knee. When it comes to assessing the end-result, minor degrees of shortening or angulation are secondary in importance to stiffness of the knee. The knee that has lost its movements presents far greater difficulties to the surgeon, and is a far greater disability to the patient, than most other results of faulty treatment. Any method of treatment taking no account of the maintenance or early restoration of knee movement must be considered with suspicion.

2. Delay in union or the establishment of non-union is more likely in the tibia than in the femur. This applies especially to closed fractures. Any method of treatment that tends to delay union will be "felt" more by the tibia than by the femur. Distraction and lack of immobilisation are more important to guard against in the tibia than in the femur.

3. On the other hand ultimate union in the tibia is practically certain. A well-timed and well-performed

bone-grafting operation can almost be said to guarantee union in the tibia, whereas operation for non-union in the femur is both more difficult and less sure of success.

4. Lastly, infection is of more evil significance in the femur than in the tibia. The problem presented by the septic femoral fracture, with abscesses pocketing deep in the muscles and tracking up into the buttock, cannot be compared with that met with in the superficial and accessible tibia with its less muscular relations. The effects of sepsis on muscle adherence, and consequently on knee movements do not require further elaboration.

POSSIBLE COMBINATIONS

With these general principles in mind we will now consider the four possible combinations of simple and compound fractures.

Both fractures simple.—In our opinion treatment here is clear-cut and easily defined. On the principle of "forgetting" one fracture, it would seem there is the clearest possible indication for plating the tibial fracture. This done, the femoral fracture can be treated as if it existed alone, traction being applied by a tibial pin. Knee and ankle movements can be maintained almost from the start.

Femur compound, tibia simple.—If the case is seen early, if the compound element is minimal, or if the wound is both little infected and remote, our policy would again be to treat the tibial fracture by early internal fixation. If for any reason this is thought

ANALYSIS OF CASES

Sex and age	Femur	Tibia	Tib. plate	Tib. graft	Fem. plate	Amput.	Knee range	Time of union (weeks)	
								Femur	Tibia
M 22	S	S	Yes	—	—	—	180-60°	16	16
M	S	S	—	Yes	—	—	180-160°	45	73
F 15	S	S	—	Yes	—	—	180-90°	20	20
M 33	C	S	Yes	—	Yes	—	UT	UT	—
M 23	C	S	—	—	—	Yes	UT	UT	—
M	C	S	—	—	—	—	UT	UT	—
M 18	S	C	—	—	—	—	180-130°	16	UT
M 27	S	C	—	Yes	Yes	—	180-150°	16	39
M 24	S	C	—	—	—	—	UT	UT	50
M 56	S	C	—	—	—	—	180-155°	18	34
M 27	S	C	—	Yes	—	—	180-70°	30	52
M 31	C	C	—	—	Yes	—	180-140°	27	70
M 22	C	C	—	—	—	Yes	180-175°	70	52
M 29	C	C	—	—	—	—	180-130°	27	80
M 37	C	C	—	—	Yes	Yes	—	—	—
M 38	C	C	—	—	—	—	UT	UT	—

S = simple. C = compound. UT = under treatment.

inadvisable, the lower fracture should be reduced to as satisfactory position as possible and immobilised by a below-knee plaster. With the limb in a slung Thomas splint, and traction from a tibial pin or from the skin above the knee, early movement of the knee can be practised.

In this class of case and in the next it may be said that there is a place for treatment by two pins, one in the tibial crest and one in the os calcis, separate traction being taken from each. We feel, however, that such methods are seldom advisable. They make it difficult to maintain knee movement and it is doubtful whether the considerably increased complications of treatment are justifiable.

In general one should concentrate on the femoral fracture and on the restoration of knee function. If necessary, as has been said already, delayed union or mal-union of the tibia is capable of satisfactory late correction. Another comforting fact is that in this type the compound