The statement "P.C.++ and E.C.++" leaves much useful information unsaid, as it alludes only to the number of cells present and gives no indication of their size, type, or state of degeneration.

One of our sick-berth ratings has been specially trained in the carrying out of three procedures—the two-glass test, the Gram stain, and the irrigation technique. It is impossible to overstate the importance of the two-glass test. The simplicity of this procedure is obvious and its merit as a guide in a day-to-day study of the course of the disease indisputable. We are indebted to Pelouze for an invaluable routine method of graphing the results of the test, which we always place at the bottom of the first page of our records.

Below is a table showing the number of cases of urethral discharge which we have treated, listed under three simple headings; 76 of them were due to the gonococcus:

Total Cases	Non-specific Urethritis	Gonococcal Urethritis	
		Anterior	Posterior
93	17	49	27

Here we are not concerned with the non-venereal infection; nor would it be consistent with the theme of this paper to publish a detailed analysis of the venereal cases. The latter, however, do serve to illustrate the problems we have met.

The first of these is that, of the 76 cases of gonorrhoea, only 36 came to us with the history of a primary discharge of not more than three days' duration, whereas 40 gave one of the following histories: (1) discharge of more than 72 hours' duration; (2) relapse; (3) reinfection; (4) persistent discharge in spite of treatment. Secondly, of the cases in this latter group of 40, some came to us with no case notes, while the majority had inadequate histories. It was reasonable to expect that a large number of these cases would have infection of the posterior urethra, which indeed proved to be so. Individuals with such a complication are potential hospital patients, and it follows that they present the greatest difficulty in treatment.

How often we have wished that the Navy would state emphatically that cases in which the posterior urethra is considered to be infected are to be discharged to hospital! There is no doubt that this measure would considerably reduce the number of cases of the type discussed in this group. We appreciate the fact that it is not always possible to discharge such cases to hospital, and that there are few medical officers afloat who have sufficient experience and facilities to treat such cases on board, but for our purpose this small group need not be considered.

In the matter of treatment we make no plea for uniformity, but certain negations must be appreciated. Here the caution "Leave well alone" is often a timely warning where simplicity of therapy encourages meddling. We are of the opinion that on the one hand not enough use is made of existing facilities, admittedly often limited, while on the other there is a tendency to plunge into the realm of the venereologist. Do not let us be swept along with a flood of new therapies.

Here it might be of interest to mention some of the major pitfalls in the treatment of gonorrhoea that we have observed in following through our case histories.

1. The failure to appreciate the exact nature and extent of the pathological changes which have taken place, due often, it appears, to an inadequate knowledge of the detailed anatomy of the urethra and its adjacent structures.

2. The Dangers of Prostatic Massage.—There is a general appreciation that the prostatic tissue is involved in infections of the posterior urethra. Further, Lees and Lloyd have both shown that the administration of chemotherapy for gonorrhoea encourages an inflammatory response in the prostate. This is due to the inhibitory effect of the drug on the metabolism of the organisms, thereby allowing the tissue defences the maximum opportunity of destroying them. With this in mind it is obvious that digital irritation of the gland at this stage is contraindicated. We never carry out this procedure until seven days after the cessation of sulphonamide administration.

3. The Passage of Sounds.—An ill-timed prostatic massage can do enough damage; sounds can do a hundredfold more. Certainly, in experienced hands they are of established value, but in their indiscriminate use lies the danger of causing stricture, epididymo-

orchitis, etc. Be it sufficient here to make one generalization: Never pass a sound if the gonococcus can be demonstrated; when performing a test of cure it is wise to wait until three weeks after the discharge has ceased before employing sounds.

4. Perseverance with Sulphonamide Drugs.—Medical officers frequently do not realize that a case that has failed to respond to two courses of a sulphonamide is unlikely to benefit from a third course of double the optimum dosage. All too often cases of gonorrhoea are flogged with course after course of sulphonamides.

5. Failure to Perform a Thorough Test of Cure.—It is sometimes impossible to discharge cases to hospital for urethoscopic examination or even for a Wassermann test. Nevertheless a reasonably satisfactory test of cure can and must be performed, particularly after an apparent "sulphonamide cure." If the medical officer is likely to lose sight of the case it should be impressed on the patient and his executive officer that complete tests of cure must be performed as soon as the opportunity arises.

Conclusion

It was our original intention to submit this communication to the Medical Director-General for publication in a Royal Naval medical journal. Had we done so we would have left unsatisfied a conviction that our plea might have had a wider appeal. Prominent in all our minds at the present time is the desire to do everything in our power to achieve unity and team-work in the profession. For others the war may well have passed the critical stage, but for us the outcome lies at this very moment in the balance. This paper is a plea in a limited sphere for a more co-operative attitude and a closer inspection of one's personal routine. By so doing, each individual one of us may feel that he is helping to turn the scales.

Summary

There is a need for greater co-operation and team-work in the management of cases of gonorrhoea.

Stress is laid on the importance of a comprehensive history sheet, and methods of tabulation are discussed.

Conclusions are drawn from 76 cases of gonorrhoea treated on board ship, and some common faults in therapy which have come to light are recorded.

We wish to acknowledge our indebtedness to the Medical Director-General of the Navy, Sir Sheldon Dudley, for permission to publish this communication.

TREATMENT OF WOUNDS BY DELAYED SUTURE

BY

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The initial operative treatment of soft-tissue wounds in conjunction with sulphonamide or penicillin therapy, and early secondary suture along with the technique of penicillin administration, are intended to prevent or minimize infection as well as to encourage early healing. In spite of these efforts in the forward areas, it is my experience that very many granulating wounds, some of considerable size, still reach the base hospitals with infection well established. Some time has usually elapsed since the injury, and these wounds are regarded as "old," but healing by granulation tissue should not be accepted as the inevitable outcome.

Part of our obligation is to obtain a soundly healed wound in the shortest time. This infected granulating type of wound takes weeks and sometimes months to heal if left to granulate, nor is it wise to attempt a secondary suture. In my opinion these wounds can be very easily treated by the "cure" of excision and suture, as opposed to the "prevention" of the early treatment, and it is on that account that this method has been investigated.

Operative Technique

This should consist of four phases: (1) control of infection and the preparation of the wound; (2) estimation of the optimum time for operation; (3) the practical details of the operation; and (4) the post-operative care of the wound.

1. *Control of Infection.*—If there is no infection in the wound no special pre-operative treatment is necessary. As a general

rule the degree of infection varies. In some cases no alteration in the ordinary routine treatment need be made: if the infection is resistant or fairly heavy a course of penicillin locally will be required to bring the wound into a state suitable for operation. It is very necessary in this late type of wound to have as low a degree of infectivity as possible before excision; the only certain estimation of non-infectivity is by bacteriological control. Contamination of the wound should be avoided by full precautions during dressings; rest in bed should be regarded as a necessary part of this phase.

2. *The Optimum Time.*—It should be said quite definitely that there is no fixed optimum time for this type of operation. One found, however, with the technique adopted, that better healing was obtained in older wounds, but, with satisfactory results from the suggested pre-operative treatment, the waiting period may be cut down considerably. Each wound can be assessed only by its clinical condition; the degree of infection determines the best time to operate.

3. *Operative Details.*—Practically all wounds can be done under a simple pentothal anaesthesia, followed by gas and oxygen if necessary; local infiltration is not recommended. The first essential is to adopt a complete surgical preparation as for any major operation and to avoid any tendency to skimp preparation. The technical steps are as follows:

(a) A clean and complete excision of the epithelial edges and all the granulation tissue down to and, if necessary, through the deep fascia. The correct axial direction for the excision will have been determined already by the initial operative treatment; this will be mainly longitudinal. A margin of 1/8 in., or at the most 1/4 in., will be sufficient to cut beyond the epithelial edge into normal skin; the ends of the incision must be very exact and allow the opposing skin edges to lie neatly in apposition. The length of the incision is of no consequence; the incision should be at a right-angle to the skin surface. This leaves a clean operation field exactly comparable to a planned operation incision, except for the possible gap in the deep fascia.

(b) The skin edges are next undercut and freely mobilized; this enables even a moderately wide gap to be sutured without tension—a point of great importance.

(c) Haemostasis should be as absolute as possible.

(d) The skin edges and the depth of the wound are now dusted with a fine "hoar-frost" covering of penicillin or a sulphonamide, alone or in combination.

(e) Any hole or gap in the deep fascia covering the underlying muscle should be carefully repaired; this, in my opinion, prevents the scar from becoming adherent.

(f) The wound is now carefully sutured. In most cases closure can be complete if one feels certain that all dead space has been obliterated; occasionally it may be safer to use a small fine drain from one end of the wound for 48 hours, or a small central "hole" may be left in the suture line.

(g) The completed suture line is given a final "hoar-frost" powdering, and a firm pressure-bandage is applied.

4. *Post-operative Care.*—To standardize this phase the drainage wick, if any, was removed after 48 hours. The first dressing was done on the 10th day, when the sutures were removed, the suture line again powdered, and a firm pressure-bandage reapplied. The second and third dressings were done on the 16th and 22nd days respectively, by which time healing was complete and the wound in a condition to stand up to rehabilitation. All dressings were carried out with aseptic precautions in the theatre. Wounds on the flexor surfaces of joints, of buttocks, and the back require careful post-operative supervision. The patient was confined to bed until healing of the wound was complete. A limb was always immobilized if necessary, to obtain rest. All cases of this nature were segregated in a "clean" ward.

Practical Features of the Investigation

A number of granulating wounds, practically all infected, were submitted to the strictly uniform operative detail described above. In order not to obscure the effectiveness of the operative part of the technique, no particular attention was paid in any way to pre-operative control of infection. No case was specially selected. A wound was decided, crudely perhaps, to be suitable for suture simply when it looked clean—there was no bacteriological control. The bacteriostatic agents employed were sulphanilamide, sulphathiazole, and penicillin (which was probably some months old: its strength was 5,000

units per gramme); three separate series of cases were treated, and each was given a different powder.

The success of the technique was judged entirely on the healing of the wound and any degree of infection which may have developed. It has been estimated on a percentage basis for tabulation as follows:

- (i) Completely healed on 10th day without infection and remained healed subsequently .. 100%
- (ii) Very minor stitch-hole infection: wound a little "grumbly" but dry and healed at 2nd dressing on 16th day .. 90%
- (iii) Definite stitch-hole infection with some pus or discharge; perhaps slight wound-gap in places; but dry and healed on 22nd day .. 80%
- (iv) Infection prolonged after 22nd day; some definite breakdown of suture line; likely to be some granulation .. 70%
- (v) Failures; and generally poor or worse results than in previous group .. below 70%

Clinical Results of Method

Series 1.—This consisted of 10 cases. The bacteriostatic powder used was a mixture of penicillin and sulphanilamide in a proportion of 1 in 10. The wounds in this series were on the whole rather above the average size, and the time-interval between wounding and suturing was relatively long. (See Table I.) The results were quite satisfactory, 8 wounds

TABLE I.—*Series 1. Penicillin (5,000 units/g.) and Sulphanilamide: 1 in 10*

No.	Type of Missile	Details of Wound				Interval between Wounding and Suture (days)	Result %
		Location	Situation	Direction	Size (in.)		
1	Mortar	Buttock	Infero-lat.	Oblique	7 × 2½	18	100
2	HE	Calf	Postero-lat.	"	6 × 1½	33	80
3	Mine	"	Posterior	Longtdl.	6 × ¾	38	100
4	HE	Thigh	Lateral	Angled	3 × ¾	29	100
5	GSW (M-G)	"	"	Longtdl.	5 × ¾	34	100
6	"	Buttock	Posterior	Angled	5 × 1	34	70
7	HE	Arm	Lateral	Longtdl.	3 × ¾	29	100
8	"	Thigh	"	"	12 × 1½	42	Below 70
9	"	Calf	Postero-lat.	Oblique	4 × 2½	75	80
10	"	Thigh	Anterior	Transv.	2 × 1	17	90

TABLE II.—*Series 2. Penicillin (5,000 units/g.) and Sulphathiazole: 1 in 20*

No.	Type of Missile	Details of Wound				Interval between Wounding and Suture (days)	Result %
		Location	Situation	Direction	Size (in.)		
1	HE	Thigh	Posterior	Longtdl.	4 × 1	26	90
2	Mortar	Buttock	Inferior	Oblique	2 × ¾	35	100
3	"	Thigh	Ant.-lat.	"	2 × 1	70	80
4	"	"	Anterior	Angled	2 × 1	34	80
5	"	Buttock	Central	Transv.	1½ × ¾	34	100
6	Bomb	Hip	Lateral	Longtdl.	2 × ¾	31	100
7	HE	Calf	Medial	"	3½ × 1	29	100
8	"	"	Lateral	"	4½ × 1	29	100
9	Mine	Thigh	"	"	3 × 1	29	90
10	HE	"	Ant.-lat.	"	6 × 2½	22	90
11	Mortar	"	Lateral	"	2½ × 1	22	70
12	"	"	"	"	3 × ¾	22	Below 70
13	"	"	Post.-med.	"	3 × ¾	22	100
14	"	"	Post.-lat.	"	3 × ¾	22	100
15	HE	"	Anterior	"	3 × 1	39	100
16	"	Buttock	Central	Oblique	3 × 1	47	100
17	GSW (M-G)	Thigh	Medial	"	2½ × ¾	85	100
18	HE	"	"	Transv.	2½ × ¾	49	100
19	Mortar	"	"	Oblique	1 × ¾	49	100
20	"	"	"	Transv.	4 × ¾	94	100
21	"	"	"	"	4 × ¾	94	100
22	"	Leg	Lateral	Oblique	1½ × ¾	88	100
23	HE	"	"	Longtdl.	1½ × ¾	16	100
24	"	Shoulder	Anterior	"	2 × ¾	62	100
25	Mortar	Thigh	Lateral	Transv.	4 × ¾	15	100
26	"	"	"	"	1 × 1	15	70
27	"	"	"	Longtdl.	3 × ¾	13	80
28	"	"	Ant.-med.	"	½ × ¾	13	90

out of 10 (80%) being completely healed within 3 weeks. One buttock wound was poor (it actually healed completely later on after a re-suture); one thigh wound (No. 8) collapsed completely without being infected (the edges and granulation tissue had not been excised, owing to the extent and depth of the wound, and therefore there was no framework on which reparative tissue could build). The penicillin-sulphanilamide

mixture was considered to be too strong, and the series was discontinued after 10 cases.

Series 2.—This consisted of 28 cases. Sulphathiazole was substituted for sulphanilamide and the strength of the mixture decreased to 1 in 20. The wounds were somewhat smaller than in the first group and the time-interval was, if anything, some days shorter, except in a few cases in which the delay before operating was due to a heavily infected wound. (See Table II.) There was an improvement in the results over those of the first group, some 25 cases out of 28 (practically 90%) being completely healed in 3 weeks, although 7 of these were "second-class" results. It is interesting to note that 5 transverse wounds, 4 of them in the thigh, were healed completely on the 10th day.

Series 3.—This consisted of 18 cases. Penicillin was discarded and sulphanilamide used alone. The wounds in this group were smaller, the time-interval shorter, and the bacteriostatic agent weaker than in any of the other groups. (See Table III.) The results were generally somewhat inferior, only

TABLE III.—*Series 3. Sulphanilamide Alone*

No.	Type of Missile	Details of Wound				Interval between Wounding and Suture (days)	Result %
		Location	Situation	Direction	Size (in.)		
1	Mortar	Thigh	Posterior	Transv.	3 × ½	12	80
2	HE	Forearm	Ant.-med.	2 × ½	13	80	
3	Grenade	Chest	Posterior	Oblique	2 × ½	17	100
4	Rifle		Anterior	Transv.	2 × ½	17	100
5	Grenade	Hip	Lateral	Longtdl.	1 × ¾	18	100
6	Mortar	Buttock	Superior	Transv.	3 × ½	18	80
7		Thigh	Lateral	Circular	1 × 1	19	70
8	HE	Arm	Posterior	Transv.	1½ × ¾	22	100
9		Thigh	Ant.-lat.	Longtdl.	2 × 1	22	90
10			Ant.-med.	2 × ½	23	90	
11	Mortar	Knee	Lateral	Circular	¾ × ¾	23	70
12			Post.-lat.	Oblique	1 × ¾	23	70
13		Thigh	Posterior	Longtdl.	2 × ¾	25	80
14	HE	Chest		Oblique	2½ × ¾	24	80
15	Mortar	Thigh	Anterior	Longtdl.	1½ × ¾	28	Below 70
16	HE			1 × ¾	109	70	
17	GSW (M-G)	Chest	Posterior	Oblique	2 × 1	34	90
18	Mortar	Thigh	Lateral		2 × ½	42	100

14 wounds out of 18 (roughly 77%) being healed within 3 weeks, 9 of these being "second-class" results. (See also Table IV.)

TABLE IV.—*General Review of Results*

	Percentage Results					Total
	100	90	80	70	Below 70	
Series 1 ..	5	1	2	1	1	10
" 2 ..	18	4	3	2	1	28
" 3 ..	5	4	5	2	2	18
Total ..	28	9	10	5	4	56

General Review of Results

The main result of the investigation is that 47 wounds out of 56 (84%) were healed completely within 3 weeks of suturing and that 28 of these 47 wounds (nearly 60%) were healed by first intention on the 10th day. The object of changing a granulating wound into a healed wound in a short time has thus been attained. Further, in the failures no wound was rendered worse by the operation, and even the "poor" results improved on the original condition of the wound.

The combination of a strong bacteriostatic powder and a longer time-interval before suture in Series 1 and 2 has produced better results than the weaker powder and shorter time-interval of Series 3, where, however, there have been more "second-class" results. This would suggest, in this type of wound, that there may be some definite advantage in delaying operation for some time, apart altogether from the degree of infection which may be present, although the poorer results may be due entirely to the weaker bacteriostatic powder employed. These powders can be used in many varieties of strength and mixtures and in conjunction with variations in the time-interval factor.

The wounds themselves provided many interesting features during the post-operative supervision. Those which healed

by first intention produced scars just as sound as any resulting from incisional operation; the growth and strength of the epithelium did not appear to be affected in any visible way by the use of bacteriostatics. Occasionally one found on the 10th day that a wound would be a little red and "grumbly" at the stitch-holes but with a firm suture line; this very mild degree of infection never proved to be of any significance, and at the subsequent dressing on the 16th day the wound was usually found to be dry and healed. If on the 10th day the wound showed a more definite reaction, with beads of frank pus at the stitch-holes, the routine dressing was carried out, but any subsequent dressing was done when indicated. The pus was always superficial and never very copious, and did not seem to be of any great virulence—points which have been noted repeatedly when bacteriostatics were used.

Second-class results (90% and 80%—see Table IV) were considered to be those which, not healed on the 10th day, recovered from some local infection to be dry and healed on either the 16th or the 22nd day.

When portions of the wound broke down or the stitch-holes gaped, the open portions cleaned up fairly well and quickly, leaving active healthy-looking granulation tissue; sometimes the intervening epithelial bridge appeared to be rather delicate, but the underlying framework always seemed strong enough to bind the wound.

Conclusions

The causative missile has been mainly high-explosive shell or mortar shell; the nature of the missile causing the wound has had no obvious effect on healing (see Table V), nor has

TABLE V.—*Results in Accordance with Causative Missile*

	Total	Percentage Results				
		100	90	80	70	Below 70
Mortar ..	25	11	2	6	4	2
HE ..	21	10	5	4	—	2
GSW ..	5	3	1	—	1	—
Mine ..	2	1	1	—	—	—
Bomb ..	1	1	—	—	—	—
Grenade ..	2	2	—	—	—	—
Total ..	56	28	9	10	5	4

the healing process been obviously affected by the location, situation, or direction of the wound.

The direction of the new wound should be longitudinal. Longitudinal wounds are more easily repaired, and should do better mechanically than those which are transverse both to the axis of the limb and to the line of muscular contraction. Wounds are mostly opened up in a longitudinal direction at the time of the original operation, so that the direction of the new wound in most cases is predetermined.

The surface area of the granulating wound to be excised is of no consequence provided the skin edges after excision can be approximated for suturing without tension. The depth of the granulating wound has some bearing on ultimate healing, as this may harbour a potential source of infection.

The healing of 47 wounds out of 56 subjected to the treatment is a definite indication that the method of "excision and suture" can be applied to these infected granulating wounds with the expectation of obtaining a cure. Having shown the effectiveness of the actual operative technique, I believe that still better results can be obtained by the carefully planned administration of pre-operative penicillin. The sulphonamides, in the presence of infection, are not strong enough to be used alone.

The advantages gained by the technique have been: (1) a considerable saving in healing time, which can be estimated in days as against weeks of a granulation fill-up; (2) a clean first-intention wound; (3) a soft, painless, non-adherent scar; (4) a more rapid and more complete functional recovery.

Summary

A technique to cure infected granulating wounds by "excision and suture" is described. Three groups of wounds have been subjected to treatment, and 47 wounds out of 56 have completely healed in 3 weeks. The detailed results of the treatment are given and certain conclusions presented.