

had not worked for the previous six months because of her supposedly sound financial position. She had been noisy at times, putting her bed out of the room, and soaking all the bed-linen in her possession with water. She said that everyone in the house, in the street, and in London, were trying to poison her to obtain her vast fortune. She was aurally hallucinated. She could hear the voices of the spirits which told her what to do. There was no memory defect or disorientation.

Physical Findings.—No abnormality found except a slight suggestion of slurring of speech. Blood and C.S.F.:W.R. positive.

Psychiatric Picture.—A grandiose paranoid state with aural hallucinations.

Discussion

Of the nine cases here presented only one (Case 5) was a known case of G.P.I. The others had not been previously so diagnosed. It is of interest to note the diagnosis under which these patients were admitted to hospital. Three were diagnosed as toxic confusional states, one due to senility. Three others were considered to be suffering from manic states. One was thought to be a schizophrenic, another to be suffering from a psychotic depression, and another from hysterical amnesia. The commonest psychiatric picture in our nine cases was of an excited, irritable, restless state with confusion. The classical grandiose delusions were not at all prominent. Similarly, of Steel's (1960) 14 cases, six showed a manic, excited state and seven had symptoms of confusion. The features of confusion are (1) memory defect, particularly for recent events, and (2) disorientation for time, place, and person. These two symptoms are pathognomonic of mental disorder due to organic brain disease. They are not found in other psychoses. Other recurring symptoms in our cases were confabulation, and symptoms of deterioration in personality and habits. The most frequent physical signs were pupillary abnormalities, slurring of speech, and tremor of the tongue and lips. Because of an incorrect diagnosis one of our patients had been operated upon for bladder incontinence. The same thing happened to one of Steel's cases.

From our experience in these cases we are impressed with the importance of excluding G.P.I. in every case of early organic dementia or confusional state; and every manic state with impairment of memory should be regarded with suspicion. We now feel that the Wassermann reaction should be performed in all psychoses. We have been impressed with the importance of repeating the W.R. when a negative result does not support the clinical picture. In three of our cases the W.R. was negative the first time and positive on repeating the test.

It is now 15 years since the 1939–45 war ended, about the correct time interval for the appearance of G.P.I. from syphilis contracted during the war. During this period many patients were treated with penicillin for infections other than syphilis, and this may well have hidden the primary and secondary manifestations of the disease. This treatment, of course, would have been inadequate for the complete treatment of syphilis, and would not have prevented the occurrence of G.P.I. to-day. Though the disease is now almost forgotten, only 20 years ago G.P.I. was far from rare. Our recent experience suggests that G.P.I. must once again be considered in the differential diagnosis of psychotic states.

Summary

Nine cases of G.P.I. are described, all admitted in 1959 to an observation ward which had a total of 447 admissions during that year, an incidence of 2%.

It is suggested that the incidence of G.P.I. is increasing owing to syphilis contracted during the 1939–45 war.

The wide use of penicillin during and after the war may have hidden the early stages of syphilis, but may not have eradicated the disease.

The psychiatric picture of G.P.I. is discussed, the commonest features in our cases being memory impairment, confusion, disorientation, personality deterioration, manic excitement, irritability, and delusions.

The commonest physical findings were pupillary abnormalities, slurring of speech, and tremor of the tongue.

The importance of excluding G.P.I. in all psychoses with evidence of early dementia is emphasized.

We are indebted to Dr. J. S. Harris, physician-superintendent of Claybury Hospital, for his assistance with the case histories and clinical findings in some of the cases.

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A COMPARISON BETWEEN EPIDURAL ANAESTHESIA AND BED REST IN SCIATICA

BY

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Epidural anaesthesia is by no means a new method in the treatment of sciatica. Cathelin (1901) used it as a new route for spinal injection and described its application to man. Caussade and Queste (1909) reviewed several cases in which "sciatica" had been relieved by spinal injection of "stovaine" (amylocaine hydrochloride); but their criteria for diagnosis of the patients and their description of the technique were rather vague. Evans (1930) investigated the results in 40 patients with sciatica, and claimed that 22 were cured; up to 145 ml. of fluid was injected, the average being 98 ml. On different occasions he injected normal saline, 1% procaine, 2% procaine, and 1% procaine followed by normal saline; 14 of the patients had neurological signs, recorded as impaired or absent ankle-jerks. In 39 of the 40 patients straight-leg raising was painful.

Kelman (1944) recorded the results of 486 injections into 116 unselected patients with "sciatica." Eight of them were "cured," 41 showed marked improvement, 45 had moderate improvement, 17 had slight improvement, and 5 showed no change. He pointed out that the relief of pain outlasted that expected from the anaesthesia, and suggested that the treatment had some effect on the primary cause of pain. In the light of more recent knowledge regarding disk prolapse and sciatica, it is likely that there were other causes of pain in the leg in these two series, making an interpretation of their results rather difficult. Cyriax (1957) laid down comprehensive indications regarding selection of patients for this form of treatment, and

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advocated epidural anaesthesia as the conservative treatment of choice for patients who have a low-lumbar-disk lesion, with nerve-root pressure, and neurological signs in the affected leg. Bladder symptoms were regarded as a contraindication.

It is the object of this paper to compare the results of treatment by epidural injection and that by rest in bed. Both are effective, but no previous comparison has been recorded, and there are important differences between them.

Materials and Methods

Two groups of 20 out-patients with sciatica were studied. The patients in both groups were in severe pain which was not controlled by simple analgesics, and were comfortable only in bed. Pain was graded thus for the investigation: 3 = severe crippling pain—patient forced to stay in bed; 2 = severe pain partially controlled with analgesics, patient not in bed; 1 = pain of nuisance value controlled with simple analgesics; and 0 = no pain.

The duration of symptoms before treatment was comparable in the two groups; in the bed-rest group the mean duration was 31 days, and in the epidural group 37 days. This difference was not considered significant (S.E. 10.5). The age distribution of the groups was similar: 26–64 years (mean 45) for the bed-rest group and 16–70 (mean 41) for the epidural group. The sex distribution in the groups was the same—7 women and 13 men.

A full history was taken and a full clinical examination carried out on all patients. Particular care was taken to exclude any other organic disease that could present as "sciatica." As a result of this two patients were excluded: one had a staphylococcal extradural abscess with involvement of the third lumbar-nerve root, and the other had a carcinoma of the rectum eroding backwards into the greater sciatic notch. In both of these patients the x-ray findings were abnormal; although in the former the x-ray film was normal when he was first seen. The scheme of examination of the locomotor system was the standard employed in this hospital. The lumbar movements of flexion, extension, and lateral flexion were performed and recorded, special note being made of the range, and whether or not pain radiated to the affected leg during each movement.

The sacro-iliac joints were tested by pressure on the iliac crests from the front, side, and back. Hip movements were tested and recorded. None of the patients showed any abnormality in these two joints. Careful note was next made of the angle of straight-leg raising both on the normal and on the affected side, with the patient lying flat on his back. It was also noted whether flexion of the cervical spine made any difference to the pain in the leg when straight-leg raising had reached its maximum. Ely's sign, which is virtually a reversed straight-leg raise, was looked for. The patient lies prone and both hips are extended in turn. This manoeuvre stretches the femoral-nerve and upper-lumbar-nerve roots, whereas the ordinary straight-leg raise stretches the sciatic-nerve and lower-lumbar-nerve roots.

Evidence of neurological involvement was sought: muscle power was tested, and reflex change and sensory loss were noted. Less importance was placed on the latter owing to its apparent variability from day to day. There is much overlapping of the motor-nerve supply in the legs from various lumbar-nerve roots, and as a

basis the M.R.C. (1943) pamphlet on peripheral-nerve injuries was used. However, lesions at various levels produced a fairly constant pattern in all the cases examined. The muscles selected for testing, with the various root levels, are shown in Table I.

TABLE I.—Muscles Selected for Localizing Neurological Pressure

Root Level	Muscle	Movement
L 2	Psoas iliacus	Hip flexion
L 3	Quadriceps	Knee extension
L 4	Tibialis anterior	Dorsiflexion of ankle
	Extensor hallucis longus	" " " great toe
		" " "
L 5	Peronei " " "	Pronation of "foot" " "
		" " "
S 1	Calf " " "	Standing on tiptoe
	Hamstrings	Flexion of knee
	Gluteus maximus	Wasting of buttock

The degree of muscle power was noted as being: (1) normal, not overcome, or only just overcome at maximum contraction; (2) slightly weak, overcome fairly easily at maximum contraction; and (3) weak, overcome easily at maximum contraction.

The reflex changes at the knee and ankle were noted—the knee reflex being impaired in L 3 root lesions and occasionally with L 4 root lesions, and the ankle reflex in S 1 root lesions and sometimes in L 5 lesions. The changes were recorded as being: normal, impaired, obtainable on reinforcement only, and absent. Neurological signs were arbitrarily taken to be present when there was more than one weak muscle in the group under test, or when one muscle was weak and accompanied by corresponding reflex change or quite definite sensory loss. For the distribution of cases see Table II.

TABLE II.—Distribution of Cases

Root Level	Bed-rest Group	Epidural Group	Root Level	Bed-rest Group	Epidural Group
L 3	4	2	L 5	1	0
L 4	2	3	L 5 and S 1	0	2
L 4 and 5	1	0	S 1	12	13

X-ray films of the lumbar spine and sacro-iliac joints were taken as a routine to exclude any gross bone or joint disease. No special note was made of disk degeneration, as it did not necessarily correspond to the level of nerve-root involvement. Radiologically, disk degeneration was as often absent as present. By these criteria all the x-ray appearances were normal. The method of selecting patients was that alternate cases fulfilling these criteria were either put to bed at home on fracture-boards or admitted to hospital and given such analgesics as were necessary to ease the pain. The other group were given an injection of 50–60 ml. of 0.5 procaine epidurally via the sacral hiatus.

The technique used was a simple procedure and was done on an out-patient basis, strict asepsis being observed. A 50-ml. dry-sterilized syringe and a dry-sterilized lumbar-puncture needle were used. The syringe was filled with 50 ml. of 0.5% procaine and put on one side. The patient was told to lie prone and the sacral hiatus was located by feeling for the two cornua; the skin was then sterilized locally by spirit, ether, or acriflavine 1:1,000. The operator's thumb was held over the two cornua so as to feel the landmark of the site of the sacral hiatus. With the other hand the needle was pushed through the skin vertically and then turned through an angle to bring the needle in line with the

sacrum. It was then pushed in several inches through the sacral hiatus. The patient was asked to cough to make sure that the needle was not lying intrathecally or in a vein. 50 ml. of procaine was then injected slowly, the injection taking about 10 minutes. No difficulty was encountered provided the needle was in the correct position. If undue pressure was met, it usually meant that the needle was incorrectly sited. One hand was placed flat on the sacrum to feel if any of the fluid was entering extrasacrally; if so, it would very soon show itself as a swelling over the sacrum, or in one or other sacrospinalis muscles.

While the injection was being given most of the patients complained of a temporary dull ache followed by pain down the affected leg. This passed off in a minute or so if the injection was halted. It might be necessary to stop many times during the injection to allow the exacerbation of pain to settle. When the injection had been completed the patients were told to lie flat to counteract the temporary hypotension that may develop after this manoeuvre. The injection caused no sensory change or loss of motor power in any of the cases treated, presumably because the procaine solution was too weak to penetrate far enough to anaesthetize motor, pain, or touch fibres passing through the larger lumbar-nerve roots, only the fine dural and root-sheath nerve endings being affected. After the injection these patients were examined and the findings recorded. At this time most of the patients experienced complete or considerable relief from pain, and straight-leg raising rose, often to normal.

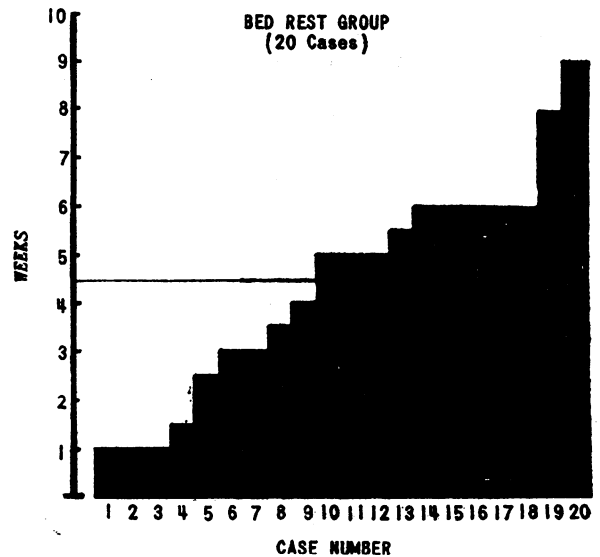
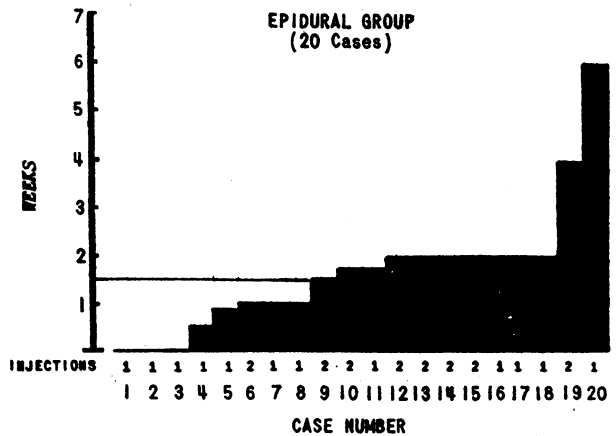
The patients were now allowed to return home and were not given any special advice regarding bed-rest. They could be up and about, but were not to return to work; and should there be any further pain they were told to take simple analgesics—usually tab. codein. co., tab. A.P.C., or aspirin or whichever analgesic suited them best. Both groups of patients were seen at weekly intervals and re-examined, the findings and the patients' assessment of pain being recorded. When the pain had gone or was of a low order (nuisance value), when the straight-leg raising was full or nearly so, and when they were able to walk around normally they were designated as "cured" for the purpose of the investigation.

Results

Each of the two accompanying histograms represents the sum of individual cases. 20 cases are included in each block, the height of which represents the number of weeks taken to attain relief of pain when up and about. The number of injections given to the epidural group is shown under each column. The first fact that becomes evident is that the epidural group did much better than the bed-rest group, almost uniformly. The mean time taken for the bed-rest group to recover was 31 days and the epidural group 11 days. This result is highly significant ($P < 0.001$) and very unlikely to have occurred by chance.

The first three cases shown in the epidural group obtained complete relief of pain after injection, and the straight-leg raising maintained its rise. In the last patient, who took six weeks to recover, the injection was not repeated more than once because of considerable technical difficulty in siting the needle correctly in the sacral canal. The duration of symptoms before any treatment was started did not seem to bear any

relation to the length of time taken to recover in either group. The age of the patients did not appear to affect the rate of recovery. The older and younger patients recovered at the same rate; this applied to both groups. There was no difference between the rate of recovery in the sexes, and the level of neurological involvement did not bear any relation to rates of recovery in either



Showing time taken for relief of pain when patients were up and about.

group. Patients with L3 root lesions recovered as quickly as patients with S1 root lesions.

When both groups were finally seen before discharge, the state of the neurological signs was assessed, being classified as: completely relieved, improved, unchanged, and worse. The criteria used in this final assessment were the same as those used throughout, and it was possible to make some assessment of the state of the neurological signs by comparing the findings on different dates. The most striking feature in Table III is that the epidural group had a greater improvement in neurological signs than the bed-rest group. Neurological

TABLE III.—Neurological State at End of Treatment

	Bed-rest	Epi dural
Completely relieved	1	1
Improved	4	11
Not changed	13	8
Worse	2	0

improvement occurred in only 5 out of 20 in the bed-rest group, whereas 12 out of 20 improved in the epidural group; from each group, one patient had complete relief from neurological signs (both of these patients were under 30). The two patients in the bed-rest group who had worsening of their neurological signs completely lost their ankle reflex, which previously had been present on reinforcement, their motor signs remaining the same.

Discussion

From this investigation it appears that epidural injection is a better form of conservative treatment for this group of patients than bed rest. The method of action of "spontaneous cure," as this relief of pain is often called, is obscure, and it is probably unwise to postulate any of the attractive theories of action. However, several features are worth further consideration: firstly, that, after epidural anaesthetic treatment, in 12 out of 20 cases their neurological signs had diminished by the time they were free from pain, compared with 5 out of 20 in the other group. A mechanical effect must play some part in this. Evans (1930) carried out some experiments in which stained fluid was injected through the sacral hiatus of a cadaver. He found that after injection of the first 10 ml. fluid was seeping along the dural sheaths, and, as more was introduced, the dura, which was anchored anteriorly to the disks, was displaced forwards, inwards, and upwards.

After 100 ml. some of the stained fluid was found in the cervical region. Although this mechanical effect must be accepted, I have on three occasions injected a similar amount of normal saline epidurally in comparable patients, not included in this series, with no improvement whatsoever; if anything, the pain was made much worse. The combination of an anaesthetized nerve sheath, of hydrostatic effect, and of painless lumbar movement must bring improvement either by relieving pressure on the nerve root or by increasing pressure, both of which are capable of relieving pain, though by different mechanisms. One patient in the epidural group, with a high lumbar-disk lesion complicated by considerable scoliosis, lost her neurological signs 48 hours after the epidural injection, although the scoliosis remained. Laminectomy was considered; but this did not prove necessary, as she gradually became straight with serial lumbar plasters.

It should be pointed out that three patients, not included in the study, who had been treated with prolonged bed rest and epidural injections had little relief from pain. Their neurological signs were unchanged. These patients had to be referred for laminectomy, at which large protrusions were successfully removed, with complete relief of pain. The complications of this treatment do not seem to be frequent. Cyriax (personal communication, 1957) stated that he had no serious complications in over 20,000 cases; though one patient was sensitive to procaine and had a reaction, necessitating artificial respiration for two hours, but was none the worse for this.

In two other cases an aseptic meningitis was produced that cleared in 10 days with no treatment. This complication was attributed to contamination of the syringe, during boiling, by acriflavine that had found its way to the sterilizer. Davies *et al.* (1958) reported the case of an elderly patient who had thrombosis of the

anterior spinal artery with permanent paraplegia after epidural injection of an anaesthetic for a femoral hernia operation. Their technique was not that discussed in this paper: the injection was between L 1 and L 2, and 27 ml. of 1.75% lignocaine with adrenaline 1:300,000 was given. Although not strictly comparable, this point should be borne in mind in dealing with elderly patients with poor vessels.

No complications were encountered in the present investigation; the only trouble met with was transient dizziness and hypotension lasting up to half an hour, and mild headache lasting at the most an hour or so, probably caused by the rise in intrathecal pressure of 30 mm. of C.S.F. that occurs with epidural injection (Evans (1930) pointed this out when he put a lumbar-puncture needle intrathecally, attached to a manometer, while giving the injection.) Apart from these mild complications no trouble was encountered, and epidural anaesthesia is felt to be a safe procedure for out-patients.

With regard to the residual motor weakness, though electromyographic tests were not carried out in this investigation, D. A. H. Yates (1960, personal communication) found varying degrees of neurapraxia and denervation present in the muscles of similar patients, and has followed them up. Recovery from the former occurred in all cases in two months or less, and from the latter in about six months in most cases. Coërs and Woolf (1959) carried out methylene-blue biopsies on this type of patient and found considerable peripheral branching or reinnervating terminal-nerve fibres, which is probably the mechanism of recovery involved in the denervated cases.

One last point that must not be overlooked in considering the two different treatments under discussion is the comparative financial cost. It is far more expensive for the patient to go to bed, remain off work for at least a month, if not more, than to be treated by epidural injection as an out-patient, with relief of pain in about a third of the time.

Summary

A comprehensive system of examination for cases suffering from sciatica has been put forward, and criteria for selection of patients for this investigation have been formulated. All the patients included had nerve-root pressure with neurological signs in the affected leg; none of them had bladder paresis.

Forty patients were studied, alternate ones being put into a bed-rest group and an epidural group. There was no significant difference in age, sex, duration of symptoms, or nerve-root-level involvements in the two groups.

The criteria for "cure" were loss of pain and normality of straight-leg raising with or without neurological improvement. The mean time taken for the bed-rest group to recover was 31 days, and for the epidural group 11 days.

Five patients in the bed-rest group and 12 in the epidural group showed improvement in the neurological signs.

The mechanism for this is discussed and the financial aspect of prolonged bed rest is emphasized.

Other series of patients suffering from sciatica, treated with epidural anaesthesia, are briefly reviewed.

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GOUT AND THE HAEMOGLOBIN LEVEL IN PATIENTS WITH CARDIAC AND RESPIRATORY DISEASE

BY

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Secondary polycythaemia as a cause of gout appears to be rare, for it receives no consideration in textbooks by such authors as Cohen (1955) and Talbot (1957), and has not been observed by such rheumatologists as A. G. Mason (1960, personal communication) or A. T. Richardson (1960, personal communication). That this is so may in part be due to selection, for the usual causes of secondary polycythaemia are long-standing cardiac and respiratory disease. The presence of gout in these conditions may be overshadowed by the major disease, and hence this association is more likely to be seen by cardiologists and chest physicians.

The relatively high frequency of gout in primary polycythaemia contrasts with the apparently low one in secondary polycythaemia; this is surprising, since the production of red blood cells, as shown by radio-active-iron studies, is several times the normal in both, and the blood volume similarly increased (Lawrence *et al.*, 1953). Although the relationship is not mentioned in standard textbooks of cardiology, there have been occasional reports of gout in those with congenital heart disease. An example was reported by Yü *et al.* (1953) in a man aged 50 with haemoglobin level of 23 g./100 ml. and a serum uric acid of 9.8 to 11.2 mg./100 ml. who had had cyanotic heart disease from birth. At the age of 35 he had his first attack of gout, and subsequently developed tophi and heart failure.

There are probably a number of unpublished cases, for the combination of gout with congenital heart disease has been observed once by A. St. J. Dixon (1960, personal communication), and several times by J. Somerville (1960, personal communication), who regards gout as a not infrequent complication of long-standing congenital cyanotic heart disease. Talbot (1959) has described an example of gout in a man with acquired valvular heart disease and secondary polycythaemia. This form of gout has been shown by Yü *et al.* (1953) to be secondary to an increased red-cell turnover with an overproduction of uric acid from nucleo-proteins. Yü *et al.* (1956) demonstrated, using ¹⁵N-labelled glycine, that there was a different metabolic pathway involved from primary gout.

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Another condition characterized by levels of haemoglobin as high as those in congenital heart disease is mountain sickness. It is of interest that Monge (1943) noted that excruciating limb pain was common in this condition, but he did not state whether this was gout, or if hyperuricaemia occurred, though certain mountaineers, the Creoles, are subject to gout (Loewy and Wittkower, 1937).

There appear to be few, if any, reported cases of gout secondary to the polycythaemia of respiratory disease. This may be because polycythaemia is an unusual response to the anoxia of respiratory failure (Wilson *et al.*, 1951). Moreover, whereas patients with congenital cyanotic heart disease may have gross polycythaemia for years, this is unusual with anoxic pulmonary disease. However, with the use of antibiotics the prognosis of those with respiratory disease has improved so that it is feasible that they may now live long enough to develop hyperuricaemia, and eventually gout. There are, it should be noted, other causes of an elevated serum uric acid in patients with cardiac or respiratory disease, such as the effects of anoxia, congestive heart failure, and diuretics on the kidneys, as well as familial gout and polycythaemia vera.

The studies presented here were undertaken to determine the frequency of gout in patients with cardiac and respiratory disease who might be expected to have secondary polycythaemia. As a guide the readily available haemoglobin estimation was arbitrarily considered, when it was 120% or more, to indicate secondary polycythaemia. A previous study by Lewis and Gardner (1960) on patients with long-standing chest disease showed that hyperuricaemia occurred most frequently at these levels of haemoglobin.

Materials and Method

The investigation was carried out at the Brompton Hospital for Diseases of the Chest. In 90 subjects (77 men and 13 women) who were known to have had a haemoglobin level of 120% (17.5 g./100 ml.) or more during the period January, 1958, to March, 1960, the case-notes, and where possible the patients, were studied for a suggestive history of acute joint pain or a previous diagnosis of gout. In addition, the records over the past few years of all the patients with gout known to the hospital were examined with reference to the associated haemoglobin level. Serum uric acid levels were measured by Folin and Trimble's (1924) modification of the method of Folin (1922). The range of normal accepted was 1.5 to 6 mg./100 ml. The haemoglobin level was estimated by the oxyhaemoglobin method, using a photoelectric colorimeter with a neutral grey solution as a standard. A haemoglobin of 100% was taken to equal 14.6 g./100 ml.

Gout in Patients with a Haemoglobin of 120% or More

The number of patients attending the Brompton Hospital with cardiac and respiratory disease, who also have a very high haemoglobin level, is relatively small. During the 27-month period of survey there were approximately 7,500 estimations of the haemoglobin concentration, and only 90 patients had a value of 120% or over. The cardiac and respiratory diseases in these patients are shown in Table I. The serum uric acid was known in 21 of these patients (Table II); the values