THE TREATMENT OF MALARIAL FEVER BY INJECTIONS OF QUININE.

By Captain C. M. Fleury.
Royal Army Medical Corps.

I think that all will agree that one of the most prevalent diseases in India is Malarial fever. Those who have served abroad must have been struck by the very large percentage of cases met with, so much so, that in many stations in India the loss becomes a very serious question when considering the efficiency of any unit. My attention was long ago drawn to this subject by the large numbers which were always to be found in the hospital, during certain seasons, suffering from malarial fever. It was also responsible for very many of the cases which came before the Invaliding Board, and it accounted for a very definite percentage of the deaths.

When cases came under treatment in hospital one could not help noticing the fact that numbers of them failed to react to quinine and arsenic when administered by the mouth. Men having every possible care and attention in hospital continued to get "fever" with the greatest regularity—even while undergoing treatment and having large doses of quinine administered daily. Many of these cases had features common to all. They were men who had served in the malarial climate for three or more years, who were apparently thoroughly saturated with Malaria, and in many cases there was enlargement of the liver and spleen. As the internal administration of drugs was apparently failing, I thought some other form of administration was indicated.

The question of simple hypodermic injection of one of the preparations of quinine was the first thing which occurred to one's mind, but on thinking the question out I came to the conclusion that if one could obtain a preparation of quinine which was readily soluble in water, and non-irritating, that then there would be a fair chance of giving the same without any great risk.

After making numerous enquiries I selected the quinina hydrochloricum acidum of the B.P., finding that this preparation of quinine was readily soluble in distilled water when warmed, and that under these conditions 1 minim of distilled water would take up 1 grain of the acid quinine hydrochloride, while 1½ minims of the water would dissolve a grain quite readily.
The first difficulty was now overcome, in that a preparation of quinine had been obtained which was soluble in water, which could be given in small bulk, and which should not give rise to any irritation, and yet permit of a large dose of quinine being administered.

The next consideration was the site and depth of injection. The buttocks, thighs, legs and arm were to my mind unsuitable, and arguing on the assumption that the nearer to the spleen I could put the injection the better would probably be the result, I determined to give the injection with an ordinary hypodermic syringe, and to put it deep into the structures below the rib, just behind the middle axillary line on the left side, so placing the injection as near to the spleen as was consistent with safety. The procedure I now adopted was carried out in every subsequent case, and briefly it was as follows:—

The patient was always carefully washed over the proposed site of injection, and the parts rendered as aseptic as possible with carbolic lotion, or some similar antiseptic. The syringe was always most carefully sterilised, and generally I made use of a 10 minims syringe with a fairly long and fine needle. The solution to be injected was prepared at the time, or at any rate not more than three days beforehand; the strength of the solution being such that the syringe when filled with 10 minims contained 8 grains of the acid hydrochloride of quinine. The solution was always injected warm. Every precaution having now been taken, the needle was driven well home into the deep structure at the site already indicated, and the puncture wound so made was at once sealed with collodion and gauze on the needle being withdrawn. The amount of quinine generally injected was 8 grains, but in some of the more severe cases it was found necessary to repeat the injection in twenty-four hours, and in one or two cases I found it necessary to give 16 grains at one injection, and no bad effects followed. The results were in practically all cases most striking. I say in practically all, because it was found that where no reaction followed the injection the patient was suffering from some disease other than malarial fever. In one or two instances it was found that patients were suffering from hepatitis, and in one case certainly, where the diagnosis was not very clear, the patient failed to react, and was found to be suffering from enteric fever.

Details, with charts of some of the more interesting cases, now follow. The majority of the patients who were so treated were those who had been resident in India for some little time, who were
The Treatment of Malarial Fever

constantly getting "fever," and who had in nearly every instance some enlargement of the liver and spleen. All had been treated for some considerable time with quinine by the mouth, and in every single instance the treatment, although carried out in hospital, had proved ineffective.

Case 1. — Gunner C., 47th Battery R.F.A., aged 20, contracted malarial fever in the Punjab. Had been getting fever off and on for months. Malarial cachexia was most marked. Liver and spleen both enlarged. Was a patient in hospital and taking large doses of quinine daily by the mouth when he came under my care. Purgatives were con-
CASE 2.—Gunner T., R.F.A., aged 22. In India one year and ten months. Contracted malarial fever at Mian Mir. Malarial cachexia well marked. Liver and spleen enlarged. Had suffered from fever off and on for six months. As will be seen by the chart, the temper-
January 3rd, followed by another three days later. I gave another injection of 8 grains, and patient remained then without any other attacks. The improvement which followed in this case was most marked. The cachexia cleared up and the enlargement of the liver and spleen disappeared.

Case 3.—Private D., Oxfordshire Light Infantry, aged 23. In India four years. Contracted malarial fever when stationed in the Punjab, and had suffered with it practically all his Indian service: was sent down to the coast for change on the same account, where he came under my care. Apparently the attacks came on every three or four weeks, and that shown in the chart is fairly typical. I gave this man 8 grains by injection on January 30th, and beyond an abortive attack on February 1st, he never had another attack while under my care or observation. The spleen in this case was enlarged and tender. No further treatment in this, as in all the other cases, was ever given by the mouth after the injection.

Case 4.—Private C., 1st West Yorks, aged 24. Only one year in India, but four in the Straits and Hong Kong. This case was a somewhat curious one. Patient had a large spleen and very pronounced malarial cachexia. On January 21st he had a mild attack which subsided, but this was followed, a week later, by a very severe one. On January 29th I injected 8 grains of quinine, and followed it up next day by another of equal amount. Next evening the temperature rose a little, but remained normal for a time after that. On February 10th he had a mild attack, and again on the 17th and 20th. On the morning of the 21st I injected him for the third time, and no further attacks resulted; so that although he remained in the station for a long time afterwards, he never again came to hospital with malarial fever.

This was one of the few cases to whom I gave three injections. Some,
perhaps, will say the third was not necessary. The absolute cure which resulted must be my justification for giving it.

Case 5.—Private B., Oxfordshire Light Infantry, aged 35. In India twelve years. This was the case of an old soldier. He had had very good health until he contracted malarial fever in the Punjab in the spring of 1900. The attack, as shown on the chart, was a very severe one, and although all kinds of remedies were tried no benefit resulted. This man had been suffering from fever all through December, with only a few days intermission between the attacks. The chart was unfortunately lost.

When he came under my care the liver and spleen were both enlarged, and malarial cachexia was most marked. I obtained his consent to inject quinine on January 29th, and the results in this case were everything that could be desired. The malarial cachexia cleared up, he rapidly put on flesh, and the enlargement of the liver and spleen subsided. At the end of two months he was in robust health. No further attacks followed during the two months he was under my observation.

Case 6.—Private B., Royal Inniskilling Fusiliers, aged 28. Five years in India. Contracted malarial fever in the Punjab. Patient had suffered with it for three years, and was continually getting attacks. He came under my care during one of these, and I injected 8 grains on February 20th. The temperature at once fell, and he had no further attacks while he remained in the station. This man was sent to the coast from the Punjab, as he was so ill. After the injection he rapidly improved and in a short time was quite well.

Case 7.—Lance-Corporal T., 1st West Yorks, aged 26. Only one year in India, but five on foreign stations, including Hong Kong and the Straits. This was a very instructive case, as the N.C.O. complained he was tired of taking quinine, as it failed to ward off the attacks, and he
was constantly getting "fever." I gave him one injection and the temperature at once fell. Until the patient was given the injection he had been taking quinine three times a day by the mouth. He remained under my observation for nearly two years and had no return of malarial fever.

Case 7.

Case 8.—Private L., 1st West Yorks, aged 25. One year in India, five on foreign stations, including Hong Kong. Patient contracted malarial fever at Hong Kong, and this was followed by a long period when he was free from attacks. Finally the attacks became most constant. For
The Treatment of Malarial Fever

one of these he was admitted to hospital, and I gave him two injections of quinine, 8 grains each time. The fall in temperature in this case was not nearly so sudden as in some of the others.

When patient came to hospital he was anaemic and had some splenic enlargement. He remained in the station for a long time afterwards, became fit and well and, so far as I knew, had no return of the malarial fever.

Case 9.—Lance-Corporal W., 1st West Yorks, aged 25. In India one year, on foreign stations, including Hong Kong, for one and a half years. This patient came to hospital in the middle of an attack and had very severe melena, but refused to be injected. He recovered under treatment, and remained free for eight days. Then, however, he had another attack, and I obtained his consent to inject; he was given 8 grains only. The temperature at once fell and he had no further attacks, although he was under observation for a long time.

Case 10.—Private P., 1st West Yorks, aged 25. On foreign service three years, but only about one year in India. This patient also came to hospital in the middle of an attack. He was kept in hospital, and while under treatment, taking quinine by the mouth, he still continued to get malarial fever. As can be seen from the chart, the type was somewhat irregular, the general tendency being a progression towards a more severe form with higher temperatures. This man when in the middle of an attack, when all treatment by the mouth was apparently inoperative, was given an injection of quinine, and the temperature at once began to fall. I had this patient under my own observation for a long time afterwards and he had no return of the malarial fever.

Case 11.—Private D., Oxfordshire Light Infantry, aged 28. Seven and a half years in India. Contracted malarial fever in the Punjab,
where he became so ill and debilitated from constant attacks that he was sent down to the coast. These attacks appeared to come on once every month. After arrival on the coast he remained free for some time, taking quinine daily, then an attack came as shown on chart. I injected him

and the temperature at once fell. This man's spleen was somewhat enlarged, but became much smaller within six weeks of the injection. He had no more attacks while under observation and his general health was much improved.
The Treatment of Malarial Fever

Case 12.—Private S., 1st West Yorks, age 24. In India one year, and two and a half years in the Straits. An example of a single attack treated by this method of injection.

Case 13.—Driver W., R.F.A., age 21. In India three years. Had constant attacks of ague, but rarely reported sick as he was an "employed" man. Looked very ill and anemic. Spleen enlarged. An excellent example of effect of one injection. Patient rapidly recovered and was free from fever for a long time afterwards.
C. M. Fleury

Case 14.—Driver J., R.F.A., aged 23. In India three years. Contracted malarial fever in the Punjab, was constantly getting attacks, though taking quinine by the mouth. Given one injection and improvement most marked. No return of fever, though patient kept under observation for a long period.

![Graph for Case 14]

Case 14.

Case 15.—Private S., 1st West Yorks, aged 25. One year in India, two and a half years in Straits. This man was another of those cases which were constantly being laid up with fever. The liver and spleen were
The Treatment of Malarial Fever

both enlarged. Malarial cachexia marked. Patient consented to have an injection of quinine and he then rapidly improved. No recurrence, though patient was kept under observation for a long period.

Case 16.—Private W., Oxfordshire Light Infantry, aged 23. Three years in India. Contracted "fever" in the Punjab. Looked very ill when he arrived at the coast for change. Liver and spleen both enlarged. This patient, as can be seen from the chart, required two injections. It was a very striking example of the benefit of the injection treatment. He rapidly improved and had no further attacks. The enlargement of the liver and spleen quickly subsided.

**CASE 16.**

CASE 17.—Lieutenant H., 1st West Yorks, aged 22. One year in India. This young officer was always being laid up with malarial fever, and treatment by the mouth appeared to have no effect on him. I gave him two injections of quinine, a week being allowed to elapse between each, and 8 grains were given each time. The fever at once ceased. Within a week of the second injection he joined a big shooting camp, and stood day after day, for about six days, up to his middle in water shooting duck. He had to ride back to camp on a camel each evening a distance varying between eight and twelve miles, and this he did in his wet clothes. No attack of fever followed and he remained free for a long time afterwards. I may add that as soon as the first injection was given all treatment by the mouth ceased. Chart unfortunately lost.

CASE 18.—A civilian, Mr. C., Public Works Department, came to me as he heard I was injecting quinine, and all treatment of his malarial fever by the mouth was a failure. Was constantly being laid up with fever, and so surely as he remained out at his work till 10 or 11 a.m., so surely did he get an attack. I gave him two injections, 8 grains in each, and allowed a week to elapse between the two. He had no more attacks. Became
much improved in health and was able to undergo any amount of fatigue and exposure. No chart available for this case.

I could go on enumerating numberless cases, but I have confined myself to the most typical and interesting ones. I do not claim that this particular method of treatment is in any way new, for indeed Manson mentions it in his book on tropical diseases. What I do claim for it is this: that we have at hand an easy and rapid method of cure. No inconvenience is caused to the patient, no headache, no buzzing in the ears ever ensues, and in that type of fever where all ordinary remedies fail one has the means of cutting short the disease in a comparatively rapid manner.

So far as my results were concerned, I may say they exceeded any possible expectation, and I trust that should others try this method that they will meet with a like success.

In conclusion, I would desire to point out that cases occur from time to time where a doubt perhaps arises as to whether the patient has been taking quinine. If you give the injection you are certain on that score. The cases I have quoted were all men in hospital, to whom the medicines ordered were given by a responsible warrant officer, and I had no reason to doubt the fact of their taking the drugs ordered.

Finally, I can only hope that those N.C.O.'s and men who were willing to submit to the injections, and so set an example to perhaps their more sceptical comrades, derived permanent benefit, a benefit which I hope and trust may have continued through all the conditions of service which may have befallen them since.