

YELLOW FEVER

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We have now to deal with the prognosis and treatment of one of the most serious of all diseases to be met with in the tropics and sub-tropics, and, unfortunately, still a menace to the lives of many of the young foreigners who come to make their livelihood in an endemic district, or to the residents of a region stricken by an epidemic of the disease. We who work in endemic or epidemic regions, have still to urge and demand that the endemic areas shall be abolished, and that the places where the disease may appear perhaps at any time or during certain months in the year shall take the necessary steps to place the district in such a state that it would be impossible for an epidemic to occur, even if some cases of yellow fever were introduced into the area. The way to attain that end is Tropical Sanitation. Tropical sanitation implies a general cleaning of a town, a campaign against mosquitos and the training of the inhabitants to recognise that certain practices are dangerous to the city and the residents. If an anti-mosquito campaign is instituted it means the abolishing of breeding spots, the screening of all receptacles used for the storing of water, and the general cleaning of the city, the freeing of back-yards from the accumulations of rubbish and the compelling of the inhabitants to keep their premises clean. Thus do we fight yellow fever by giving the mosquito, *Stegomyia calopus*, as little opportunity to breed as possible. Ross, Gorgas and others have shown we are able to free a city of yellow fever only when we have so reduced the numbers of the mosquito that, even should a case of the disease be introduced into the

community, the *Stegomyia* will be so few in number that there will be very little chance of their biting the patient. In former times the inhabitants of epidemic areas went in dread of an outbreak. It meant, in the Southern States of the United States, a 'shot-gun' quarantine: as a result the residents and their city were shunned by all and a general stagnation of trade ensued. Such methods however, are of the past. New Orleans has demonstrated what a scientific combat with *Stegomyia* can do, and she has been added to the list of successes which have always occurred where the Havana anti-yellow fever measures have been instituted. Havana and Rio de Janeiro, both endemic centres, are free of the disease, and Panama has shown how an immense engineering scheme can be executed without repeating the old tale of wholesale loss of life from yellow fever.

Despite the success of these measures in the places I have mentioned, other countries and towns have not followed suit, and in them yellow fever continues to be a scourge, and they constitute a danger-zone to all places within the limits of the *Stegomyia*.

Yellow fever is a disease which allows of little delay. It runs its course in a few days, and you must be prepared to offer battle. Fortunately many cases are of a mild type, and unless something exceptionally wrong is done the case will recover. Such cases are good for your reputation, and as yellow fever exacts a heavy toll, and as it will probably be your misfortune to lose many cases, you will need them. No one who treats many cases of the disease can avoid losing a certain percentage of his patients. There is no panacea for yellow fever as there is for malaria, but a good physician can, by his management of the case, markedly reduce the mortality.

Eliminative and supporting measures, with the reduction of the congestion, should be our aim. Briefly, we can say that treatment depends on nursing, abstinence from all food, rest in bed, and hydrotherapy in the form of alkaline waters to act as mild diuretics. Water is a very powerful remedy in this disease, and should you ever have to treat many cases of yellow fever, you will be surprised at the number of patients that recover without any other treatment than alkaline waters and good nursing.

Various types of yellow fever are met with. In adults, the extremely mild forms resemble influenza or a disturbance of the

digestive system: *Embaras gastrique fébrile*. In young children the types are milder. These forms are rarely diagnosed, and the patients recover after a few days. The danger is that the cases remain unscreened and serve to infect *Stegomyia*. The types which require treatment are numerous, and I believe it will be as well to describe an average case, and to call your attention to the pathological lesions met with in this disease; and if you will only bear in mind what macroscopic and microscopic changes are occurring in some of the organs of the body, you will be able to appreciate better the reason for the occurrence of black vomit, anuria, etc., and the multiplication of symptoms and complications seen so frequently in this disease.

You will probably be called some morning to see a patient who will give a history that he had been at work the day before and had gone to bed feeling well. Some hours later he woke up feeling uneasy, with a certain amount of frontal headache and nausea. He possibly shivered or had an actual rigor. He began to notice that his back and lower limbs ached, and gradually his symptoms increased.

On your arrival you find your patient tossing about in bed because of his pains. He will have vomited once or twice; his headache is very severe and increasing; his eyes are bright and shining and sensitive to light and, as he lies in bed, you note the general congested appearance of his head and shoulders. The mucous membranes of the lips are bright red, the conjunctivae show slight congestion, the tongue is reddened and slightly coated, the papillae appear as bright red points. The temperature a few hours after the onset will be 100 to 101° F. (37·8 to 38·4° C.); the pulse 100 to 110, hard and bounding; the respirations slightly quickened. Your patient may have vomited the remains of the last meal or some bile-stained mucus and complain of the acidity of the vomited matter. The skin is usually moist; the urine is generally scanty and high coloured. Such are the usual symptoms in a case of eight to ten hours' duration, symptoms which are common to all acute fevers.

In a few hours, i.e., eighteen hours after the onset, the appearance of the case is much worse. The congestion has increased, and the face, ears, neck and upper part of the chest are tinged a dull crimson, more or less of a boiled lobster shade. The mucous membranes are congested and tinged. The conjunctival injection has increased, the eyelids through the engorgement of the capillaries are somewhat

swollen and everted, and the space between the upper and lower lids is narrowed, causing the patient to present a ferrety-eyed appearance. The headache is splitting and is usually occipital and frontal. The least movement increases the pain, and the patient may feel as if his brain was hammering through the skull-cap. The tongue is generally coated with a light dirty yellow fur; the tip and sides are red and clean, the scarlet papillae are very distinct. On examining the gums, small capillary injections are noted about the teeth along the 'lead line.' The mucous membrane of the inner sides of the cheeks is injected, and on examining the floor of the mouth around the base of the tongue, very minute bright red points will be seen. These are especially noticeable in yellow fever, and I have rarely found them so marked in any other febrile disease. Even in mild cases they are easily observed. Always examine your cases in strong, bright daylight, as it is impossible to ascertain the colour by artificial light.

The radiating pains in the loins (*le coup de barre*) and legs are intense. The limbs feel leaden. No comfortable position can be found, and the position in bed is being constantly altered. Very often the patient is driven to cry out. The soles of his feet throb. I have had patients insist that they felt the toe nails lifting and throbbing.

Thirst is a prominent feature and practically unquenchable. The nausea has lessened and vomiting ceased, unless the case is an alcoholic or one with a history of gastritis. When vomiting continues it may prove to be most troublesome and dangerous. Probably the patient has not slept at all, and although feeling so tired and weary sleep will not come. The mind is active, the patient notices everything, and is very suspicious of his attendants and his surroundings. Albumin is rarely found so early. The temperature has now risen to 102° or 103° F. (38.9° to 39.4° C.). The pulse is 110 to 120, still bounding and hard, but regular. The respirations are about 25. About the twenty-fourth hour the pulse may not show an increase, although the temperature may still be rising. Faget's sign, the slowing of the pulse with a steady or even rising temperature, can often be observed.

At the thirty-sixth hour the fever has probably reached a maximum of 101.5° to 103° F. (38.6° to 39.4° C.) in mild cases, 103° to 104° F. (39.4° to 40° C.) in severe cases, and 105° to 106° F. (40.5° to

41.1°C.) in extremely severe ones. In very virulent and practically fatal cases, the temperature may rise even higher. The pulse may have diminished ten or more beats.

Although the vomiting has ceased there may be more tenderness over the epigastrium and sensations of burning or pain are felt. The thirst still continues. The skin is less moist. The cephalalgia and pains in the back and limbs are acute. The urine is probably free from albumin and still scanty in amount.

By the end of the second day the pulse begins to fall to 100, 90 or 80, and the temperature has remitted one or two degrees. The tongue is still coated, the injection of the mucous membranes persists but is lessened. The congested appearance of the head is less marked, the eyes are less suffused, the headache and the pains in the loins and limbs are ameliorated. The patient feels better. The urine probably contains a little albumin, which gradually increases in amount.

During the next twenty-four hours the temperature commences to fall, dropping as much as one to two degrees, the pulse decreases but at the same time it becomes irregular and without tone. The albumin increases slightly; jaundice is usually apparent. The general symptoms of the patient improve, and, if it is a mild type of the disease, the temperature and pulse will gradually fall to normal or subnormal by the fifth or sixth day, all the symptoms decreasing by degrees. In a more severe type defervescence is not so rapid; there may be epistaxis, some oozing from the gums, and the albumin in the urine may have increased from 2.0 to 3.0 grammes per litre. These symptoms only persist for a short time. The temperature and pulse usually remain subnormal for six to fourteen days. Bradycardia is common, and a pulse of 40 or 35 is not unusual.

If you recollect the microscopical appearance of the organs of a fourth day case, you will remember that up to this time the organs have only shown congestion and slight cloudy swelling, a commencing periglomerulitis, swelling and desquamation of the epithelium of the tubules with congestion of the small vessels in the cortex of the kidney. The liver exhibits greater changes, and, even on the third day, the hepatic cells will show vacuoles in the protoplasm, and there will be an infiltration of small round cells about the portal spaces

which tends to compress the lumen of the ducts and vessels. The stomach will only show congestion.

Should the patient's symptoms have not improved and the disease progress, the lesions rapidly increase. The kidneys will show all the characteristics of an acute parenchymatous nephritis, and small droplets of fat are seen. The epithelium of the convoluted tubules is especially degenerated; in many places hyaline casts are filling the lumen of the tubules. In the liver, the changes are still more evident, the fatty degeneration is well advanced, the cells show large vacuoles, and their protoplasm is granular; the hepatic lobules are deformed and the contour distorted. Around the central vein the cells are most irregularly distributed. The infiltration of granulation cells about the vessels in the connective tissue of the portal spaces has increased, and many of the vessels and ducts are obliterated. The stomach shows little points of ecchymoses, especially about the cardiac and pyloric ends; all the vessels are engorged with blood.

Remember these advanced conditions and that there is a general steatosis of all organs about the seventh day, and you will find it easy to understand the symptoms typical of all acute cases which so often result in death. There is a passive congestion due to the liver, caused by the accumulation of round cells about the vessels in the connective tissue of the portal spaces. These cells tend to compress the vessels, and the congestion is aided by the enlarged degenerated hepatic cells which compress the hepatic capillaries. Through the obstruction of the portal circulation, the blood is dammed back in the mesentery and intestine, especially about the pylorus and duodenum, where, as Carroll* points out, the vessels—the pyloric and duodenal veins—are short and with very few anastomoses. By the end of the fourth day the endothelium of the blood vessels is beginning to show signs of fatty degeneration. Under such circumstances it is no wonder that the small congested capillaries will rupture and cause black vomit. The capillaries in the stomach distend and burst, and a small ooze of blood will gradually mix with the acid secretions of the stomach. The result is the 'coffee grounds' or 'fly-speck' vomitus. As more of the capillaries rupture and ooze, the vomitus changes to a uniform blackish-grey or brown tint. It is only when

* Carroll, James. The treatment of Yellow Fever. Jour. Am. Med. Assoc. July 19, 1902.

a comparatively large vessel ruptures and there occurs an immediate attack of vomiting that we see bright red blood.

In the more severe cases the temperature will recede a little and the patient feels better; but this is only for a short time, seven to twenty hours. During the quiescent period the outcome looks rosy to the uninitiated. The patient feels himself again, his headache and pains have left him. He commences to feel hungry and demands food, and talks of being out of bed in a few days. It is hard for the onlooker to believe the improvement is only temporary and that in a few hours haemorrhages and black vomit will appear. Unfortunately such an occurrence is too frequently the case. In a few hours the appearance of the patient has altered. He is vaguely uneasy and restless. The congestion of the mucous membranes is livid. The epigastric tenderness which had lessened, reappears and rapidly becomes worse. The liver is tender, and pressure over the epigastrium is exceedingly painful. The albumin increases in amount and the quantity of urine may decrease. The temperature will begin to rise. The pulse rate will increase but not in proportion to the temperature. Tiny coffee-ground specks may appear in the vomitus; these increase in amount; they may coalesce and become streaky (it is rare to find fresh blood coagula at this stage), when suddenly, with little warning to the attendants, black or brownish-grey vomit will occur. Should the kidneys withstand the strain and continue to secrete urine, the patient can recover even if he has had several bad attacks of black vomit. If the general condition continues to become more serious, the icteric tint grows more and more pronounced. The symptoms become intensified, the black vomit may increase in frequency and amount. The patient becomes steadily worse. His mind is no longer clear, he rambles or may become delirious. The tongue is dry and coated, the lips are cracked, the mucous membrane is livid. Haemorrhages from other mucous membranes occur. There may be bleeding from the lips, gums, nose and ears. The epigastric tenderness is intense, pressure will elicit a cry from even a delirious patient. The prick of a hypodermic needle will often cause a small haemorrhage; pressure on the muscles may cause subcutaneous ecchymoses, and the condition may become so intense as to resemble a haemophilic state. Intestinal haemorrhages may occur. The bowels will move repeatedly, and

the stools will become more and more tarry and offensive. The kidneys* begin to manifest signs of the strain, the albumin is increasing rapidly, and the amount of urine is decreasing. All the symptoms point to a collapse of the renal system, but even yet the case is not hopeless provided that the kidneys are able to perform their functions. Should anuria occur and continue for more than a few hours the prognosis is of the very gravest. All this time the temperature may continue elevated, but it is generally falling and may become normal or subnormal. The pulse is running; very often it is irregular, 80 to 110. The mucous membranes are extremely pale and show the effects of the exsanguination. As the state of the patient progresses towards a fatal termination, the vomiting and movements of the bowels become intensified, or convulsions and coma intervene, and death occurs within a few hours, although we have seen the anuric state last for as long as fifty-six hours. With some patients the mind may be clear until the last few minutes. This is especially the case where collapse has occurred and the temperature has fallen very much below normal.

Yellow fever is always an impressive and terrible disease. It is striking because it attacks those who are robust and in the prime of manhood. The suddenness of the onset and the rapidity with which death follows must necessarily impress the relatives and acquaintances of the victim. Fortunately for the sufferer, the friends and attendants, the battle is short, sharp, and decisive. Those who have passed through the ordeal generally come through unscathed. Very few permanent ill effects can be recorded.

PROGNOSIS

In the mild forms of yellow fever, recovery occurs in almost every case, provided that the patient is not already suffering from some organic disease, especially of the kidneys, but even in these cases we have seen recovery follow.

In the more severe forms of the disease, where there is a certain amount of gastric disturbance and moderate albuminuria, with care

* Carroll pointed out that in the advanced stages of the disease but little urea can be formed; so that the end products of metabolism, carbonate, lactate and perhaps carbonate of ammonium are retained in the circulation and act as additional poisons. Thus anuria and ammonaemia are produced, and the delirium and coma, with or without convulsions, is due to ammonaemia and not to uraemia.

and efficient nursing the prognosis can be regarded as excellent.

Patients exhibiting a high degree or steady increase of albuminuria and a lessening in the amount of urine voided in the twenty-four hours are bound to have a severe struggle. So long as there is a fair quantity of urine passed, the amount of albumin per litre may be 20 to 40 grammes. A grave prognosis is always given when the kidneys show signs of failure and the albumin is increasing. Albumin appearing in the first twenty-four hours is an extremely serious sign. The later the albumin appears in the urine, the better the prognosis. Anuria, if long continued, is invariably fatal.

Marked jaundice on the second day indicates severe hepatic lesions, and merits a grave prognosis. The longer the appearance is delayed the more favourable the prognosis. Severe jaundice is generally associated with delirium; it is usually the forerunner of haemorrhages, and if there is coincident failure of the urine or severe albuminuria the outlook is most gloomy.

Haemorrhages. Epistaxis is a not unfavourable sign, and the patients appear markedly relieved after they have lost some fifty or more grammes of blood. It is quite common to meet with it as one of the prodromal symptoms. Severe and long continued epistaxis is to be feared.

Bleeding from the gums is not unusual and is not dangerous, provided it only appears about the fourth to fifth day and is not excessive. An early appearance on the second or third day and copious haemorrhages indicate a severe attack, and in all probability other haemorrhagic complications will occur. Copious haemorrhages from the inside of the cheeks and the tongue are prone to occur through the patient accidentally biting the tip or sides of the latter or the mucous membrane of the cheeks.

Gastric haemorrhages are always an indication of a severe type of the fever. Black vomit occurring within the first two days of the disease is of the very gravest import. Though it is always a bad symptom and demands a guarded prognosis, patients whose kidneys are acting well can develop black vomit on the fourth or fifth day and recover. The longer black vomit is delayed the better the prognosis. Marked failure of the renal system associated with this complication is almost invariably fatal. Black vomit appearing in cases whose gums are already bleeding generally indicates a fatal termination.

When black vomit appears abundantly and frequently, the prognosis is always grave.

Other haemorrhagic conditions, such as the purpuric patches on the body, ears, etc., extravasations of blood into the conjunctivae, a general haemophilic condition when every orifice bleeds, are only seen in the malignant and fatal types of yellow fever. In women it is not uncommon for menstruation to appear before the customary time or to reappear in fatal cases. Haemorrhage may occur from the uterus, vagina or urinary bladder.

Delirium must be regarded as a grave symptom, and if occurring during the first couple of days is almost invariably fatal. Occurring after the fifth day the prognosis is favourable. One of the great dangers to be feared from this symptom is that the patient in the violence of his delirium induces other complications and cannot be properly nursed. Rambling and incoherence are common symptoms of all severe cases. A moist skin in the early stages of the disease is of good omen. The cold clammy skin encountered in collapse and afebrile forms is to be dreaded.

Temperature. The degree of fever is of value if it is taken into consideration with the other important symptoms. A high temperature associated with copious urination and scanty albumin is favourable. A moderate fever of 103° to 104° F. (39.4° to 40° C.) with an early and rapid fall is a good sign. Bad prognoses are when the temperature remains up for several days, is at a moderate level for the first thirty-six hours, and then rises, or if a temperature of 105° F. (40.5° C.) and over occurs in the first twenty-four hours. Rapid defervescence on the second or third day to subnormal is to be feared if the pulse exhibits a high degree of bradycardia. A subnormal temperature associated with haemorrhage is extremely unfavourable.

A guarded prognosis should be given in alcoholics; fast livers; overworked persons; patients who persist in disobeying the nurse and doctor; patients who have delayed acknowledging they were ill; ambulatory cases or patients whose constitutions are already weakened by disease; pregnant women, and patients whose bodies, through improper treatment, have been made receptacles for numerous drugs.

An excellent prognosis is a slightly moist skin; a good secretion of urine, 900 grammes or more per day, a moderate amount of albumin and jaundice; a quiet digestive system, which will allow of fluids

being freely taken; slight epistaxis; a restful disposition and ability to sleep, and fever from 102° to 103.5° or 104° F. (38.9° to 39.7° or 40° C.) with gradual defervescence by the third day.

A fair prognosis is a drier skin; 600 grammes of urine, albumin increasing but not exceeding 2.0 to 3.0 grammes per litre; light jaundice; slight attacks of black vomit which occur on the fifth day, or glosso-labial haemorrhages.

A serious prognosis is a dry skin; high fever of 103.5° to 104.4° F. (39° to 40.2° C.) for two or more days; considerable gastric disturbance from the onset; early appearance of albumin which, although in small amount, is associated with a diminution in the quantity of urine, 400 to 600 grames; much jaundice; hiccough, fairly copious black vomit; epistaxis, glosso-labial haemorrhages; tendency to become delirious; feeble and thready pulse.

A very grave prognosis is the above with greater tendency to copious black vomit and haemorrhages; hiccough constantly recurring; violent delirium; pronounced icterus and failing renal system; symptoms of collapse and subnormal temperature, or a history of temperature falling on the third or fourth day and followed by a sudden rise to 104° F. (40° C.) with complications such as abscesses of the parotids or pneumonia.

MANAGEMENT AND TREATMENT

The most important points in the management of yellow fever cases are nursing, absolute rest in bed, restriction of all nourishment for the first few days, the use of alkaline waters and the cautious administration of drugs. You must make yourselves responsible for the entire management of the case, and should:—

1. Obtain as full a history of the onset as possible, and of the patient's habits, temperament, etc.
2. Examine your patient thoroughly, and do not postpone the examination. Yellow fever is a disease which runs too rapid a course to permit of any delay.
3. Examine a fresh specimen of urine. If you have been summoned within the first twenty-four hours it will probably contain no albumin. Give orders to preserve all the urine passed by the

patient and arrange that the necessary covered jars are provided so that the full quantity for the twenty-four hours can be kept. See that a special jar is always ready for holding the last urine voided.

Give orders that the patient shall urinate before the bowels move or before a clyster is given. This is important, as later on when the amount of urine is decreasing, much urine may be lost in the bed-pan. Examine the urine for albumin and test the reaction at least twice daily, until convalescence is established. You have to ascertain the time when the albumin appears and afterwards the information obtained from the daily examination of the urine as to the amount of albumin, urea, and the reaction will be one of the most important guides to the prognosis and management of the case. Albumin is generally present in this disease, appearing between the second and third day. In severe cases it may be found in the first twenty-four hours. In very mild cases it may only appear for a few hours. In some cases it is never found throughout the course of the disease.

4. Obtain a trained nurse. Too much care cannot be given to the patient, and severe cases will require two trained nurses. In default of trained nurses your patient will suffer, but it will not be your fault.

5. Give instructions to have the temperature, pulse and respirations taken and recorded every two to four hours, and check the results by doing it yourself at least twice in every twenty-four hours.

6. Order the patient to be screened both day and night. Do not fail to insist on the utmost care being taken to prevent *Stegomyia* feeding on the patient. The lives of all non-immunes depend in a great measure on this precaution being observed. Even if you have not made a positive diagnosis, so long as there is the least suspicion that it may possibly be yellow fever, your duty is to insist on the screening. The screening saves your patient from being annoyed by mosquitos, and is an educational factor to the general public. If it is a case of yellow fever, and over the fourth day of the disease, the patient is non-infective and screening is not absolutely necessary.

7. The various rules and regulations of the Sanitary Departments should be complied with.

Nursing.

If trained nurses are available, give the instructions about urine, temperature, pulse, medicines, etc., in writing. See that suitable temperature charts are provided. Failing trained nurses, willing volunteers must be instructed, but in severe cases the lack of skilled nursing cannot but militate against the ultimate outcome. A yellow fever case requires to be nursed even more intelligently than a typhoid case. The disease is rapid; it is a question of hours, not of days, and when the critical moment arrives, unless you are on the spot, much valuable time will be irretrievably lost. I speak from experience, as my colleagues and myself are heavily handicapped by lack of trained lay nurses in treating patients in private houses. Many a time have I had to acknowledge that the public hospital yellow fever patient was better provided for than the richer private patient. The volunteers are willing, but the facilities for nursing are absent and impossible to obtain.

Until well on the road to recovery the patient should never be left alone. Visitors must be prohibited, and only those actually in attendance on the case should enter the room.

The room should be large and airy, and the bed should be so arranged that day and artificial light will not cause annoyance. Photophobia is frequently a most distressing symptom. Ventilation is necessary, but care should be taken that the patient is exposed to no draught. The bed should be narrow and have good springs; the mattress should be covered with a rubber sheet. The bedclothing should be light. A sheet is usually sufficient.

The necessary bed-pans and urine-bottles should be procured. A generous supply of bowls should be ready for catching the vomitus, and when black vomit appears these should be changed as quickly as possible. Ice and ice-bags are necessary, as is also a hypodermic syringe, previously sterilised and ready for any emergency, and a collection of ampoules of caffeine, spartein, strychnine and ether, and some tubes of ethyl chloride; cotton wool for the gums and nates; a cleansing solution for the mouth.

The patient should be made to understand that absolute rest in bed is necessary. If possible the faeces and urine should be passed in the bed-pan and bottle. No excitement should be allowed, and if sleep can be obtained the outlook is all the better.

TREATMENT

Purge.

As practically all cases of yellow fever have been in robust health until suddenly stricken with the disease, it is advisable to give a purge. Some doctors prefer castor oil, others fluid magnesia, various cathartic mixtures or large doses of calomel. I favour small fractional doses of calomel followed by sodium sulphate. The latter is an excellent diuretic and, with the calomel, often allays the acidity of the stomach. After the preliminary purge, it is inadvisable to give any more, as we should irritate the bowels as little as possible, and enemata will answer the patient's needs.

Diaphoresis.

When the purge has been taken, a hot mustard foot-bath or hot pack should be given. In order to induce free diaphoresis hot demulcent drinks should be taken. Free perspiration for a short time is comforting to the patient and markedly relieves the congestion. Care should be taken to avoid the symptoms of excessive sweating, which are so graphically described by Carroll.* Sweating should be confined to the first twenty-four hours of the disease.

Enemata.

It is an almost universal custom to order clysters, and they vary as to amount, number and composition. One large one every twelve, sometimes every eight hours is sufficient. Some doctors use solutions of boracic, others eucalyptus, sodium chloride or sodium sulphate. I prefer the two latter, using about 600 c.c. or 1 litre of solution to be injected slowly and retained as long as possible.

The eucalyptus and boracic are supposed to be excellent, but I believe that their virtues rest in the mere cleansing of the lower bowel and the sensation of comfort imparted to the patient. The temperature of the clyster should be usually about 65° to 70° F. (18.5° to 24° C.). Some prefer to use ice-cold enemata, but they generally cause the patient discomfort and do not appear to reduce the temperature very much.

* Carroll, James, *loc. cit.*

Nourishment.

Prohibit all nourishment for the first three or four days. The patient is able to do without any food, and his stomach obtains the needed rest. Some doctors give small quantities of milk, but it only increases the tendency to nausea, and is almost invariably vomited.

Alkaline drinks.

Vichy, source Célestins, is universally used for quenching the thirst of the patient. It is an excellent alkaline diuretic water, and is readily taken. Because of the burning thirst the patient will be eager to consume large quantities of this water, and he should be encouraged to drink three to four litres daily. He is liable to drink to excess and over-distend his stomach, causing vomiting. It is therefore advisable that he should be given definite quantities at regular intervals; a cocktail glassful every quarter of an hour should be offered him; this he can sip or drink at once. Should he fall asleep and miss part of the allowance larger quantities should be given on his awakening. The great aim being that at least three litres should be imbibed daily. The amount of urine increases at once, the kidneys are well flushed, and the acidity of the stomach corrected. The Vichy can be given iced or at room temperature. You will find the majority of patients prefer Vichy as cold as possible. A few patients dislike Vichy, and in that case Apollinaris, Mattoni, or any other carbonated alkaline water can be substituted. If the water is very gaseous, it is advisable to allow some of the gas to escape in order to prevent much gas being retained in the stomach, inducing eructations and possibly hiccough. In the absence of Vichy or other alkaline water, you can alkalinize the ordinary drinking water with bicarbonate of sodium. Some doctors use the juice of fresh limes mixed with potassium bicarbonate to render the drink neutral. Occasionally this can be given in the first forty-eight hours, but the alkaline water does not upset the stomach, and larger quantities are drunk, which is what we aim at.

Venesection.

As a rule this mode of treatment is not necessary, but very plethoric subjects are considerably eased by the removal of 100 to 150 c.c. blood. I have had patients implore me to repeat the venesection. In the past, patients were almost exsanguinated, hence blood-letting

fell into disuse, but where the congestion is intense, the carotids visibly pulsating and the veins engorged, venesection is indicated in the robust, and is often the only remedy which will relieve the splitting headache. It is of no use in the later stages of the disease.

Ice-bags.

For the cephalalgia, applications of ice are of use, and especially when applied in the helmet ice-bag which covers the entire head from the forehead to base of the occiput. A Leiter's coil can be used. An ordinary rubber air-cushion or a hot-water bag filled with ice-water affords great relief to patients who will not use the ice-bag. For the vomiting an ice-bag can be used. An excellent plan is to use a spray of ethyl chloride. This frequently checks the tendency to vomit and can be instantly applied.

Spongings.

These are most excellent and should be used according to the degree of fever and the reaction exhibited by the patient. Spongings should be given every two hours if the temperature exceeds 101°F . (38.3°C .); if over 103°F . (39.4°C .) every hour. The temperature of the water should be from 75° to 60°F . (24° to 15.5°C .) or even lower.

Baths.

Cold baths are valuable if the temperature is over 104°F . (40°C .), but are only advised if they entail no undue exertion on the part of the patient. A sufficient supply of water, the necessary full length bath, and assistance, etc., are usually wanting. Hence spongings are more favoured.

Cold packs.

Are useful, if assistance is limited.

All of these applications are grateful to the patient, and if properly given are of great help during the fever period. It is hardly necessary for me to tell you that you will have to initiate all these forms of treatment in order that you may determine if a suitable reaction is being obtained, and to teach the nurses. The spongings or baths render good service in keeping the skin of the patient clean, and help to lessen the formation of boils.

Care of the gums.

The gums and mouth should be most carefully attended to. The gums are especially prone to become spongy and to bleed. Inflammation of the parotids with abscess formation is a frequent complication. The use of the tooth-brush should be interdicted and the teeth cleansed with tooth-powder and pledglets of cotton wool. An anti-septic mouth-wash should be used four or six times a day to harden the gums and relieve the filthy taste in the mouth.

Many cases will require very little more treatment, and drugs should not be given unless absolutely necessary. Your main care should be to supervise the nursing, absolute rest of the patient, starvation, the early purging and sweating, the reduction of the fever by cold spongings or baths, the use of alkaline drinks, enemata, ice-bags to the head and cleansing of the mouth and gums. It will require all your vigilance to direct the nursing and management of the case and to check the condition of the patient by his temperature, pulse rate and the action of the kidneys.

Yellow fever is a disease which cannot be cured by drugs, and while employing symptomatic treatment you should endeavour to avoid causing any irritation to the stomach.

In addition to Vichy many doctors prescribe fluid magnesia with benzoate of soda, bicarbonate of soda either in cachets of 1·0 to 2·0 grammes every three to four hours, or in solution of 1·5 to 2·0 grammes to 100 c.c. of water, giving 30 c.c. every hour. I prefer the cachets, as they are not so disagreeable to take. If abundant alkaline water is drunk, and sodium carbonate or magnesia is given in addition, the acid reaction of the urine will gradually give place to a neutral or alkaline reaction. This is a favourable indication.

Kidneys.

Should the urine, despite the drinking of abundant alkaline waters, rapidly decrease in amount and failure of the renal system appear imminent, no time must be lost. Caffeine citrate is a cardiac tonic and acts beneficially on the kidneys. It is easy to administer in the form of hypodermics, and should be given in preference to other stimulants. If the kidneys fail to respond, it is justifiable to give theobromine, 2·0 to 3·0 grammes in the course of the day, usually in cachets of 0·3 to 0·5 gramme, or in the form of an emulsion of

theobromine, benzoate of soda, and sufficient gum. Hot air-baths, hot hip-baths, linseed poultices to the loins or a localised hot pack can be tried. Carroll* suggested that a hypodermic or rectal injection of urea (1·0 gramme) might be given if anuria is impending.

In order to ascertain if the kidneys are freely functioning, the patient should be trained to use the bottle every two or three hours. In this way we can gauge the reacting power of the kidneys. It sometimes occurs that the urinary bladder becomes paralysed, and therefore if no urine is being voluntarily voided, the patient should be catheterized. Retention of the urine is usually a bad omen.

Alcohol in the form of good sound champagne is generally used. It is a useful stimulant and is well taken by the patient. A good Rhine wine is preferable. Vichy should be added to the wine. Do not use red wine, as, should the patient vomit, the mixture might be mistaken for black vomit.

Irrigation of the lower bowel with sodium sulphate should be tried. Never despair of your case so long as the urine continues to flow. It has been suggested to perform decapsulization of the kidneys; it may be tried, as the pathological processes are not so intense that all the kidney substance is destroyed.

Vomiting.

This is a most common symptom. It is usually present in the first few hours after the onset, but with abstinence from all food and carefully regulated drinking of Vichy it generally ceases. In alcoholics or patients who have previously suffered from gastritis, vomiting is apt to be a marked symptom of yellow fever. Cease giving any liquids for a couple of hours and then cautiously begin with spoonfuls of iced Vichy. If the patient complains of thirst let him wash his mouth with strong black tea or acid lemonade, but do not allow him to swallow. A sinapism of mustard or an ice-bag to the epigastrium is useful. Chloride of ethyl applied in a fine spray to the epigastric region when a paroxysm of vomiting is about to occur, very often stops the attacks. No medicines must be given by the mouth for some hours after vomiting has ceased. Give the alkaline treatment in the form of small clysters of bicarbonate of soda. Sucking cracked ice is useful in nausea.

* Carroll, *loc. cit.*

Lavage of the stomach has been tried, but is rarely successful. Cocaine, chloroform, tincture of peppermint are advised by many, but nothing succeeds like absolute rest, and the doctor must see that it is enforced, as continued vomiting invariably brings on black vomit and wears out the strength of the patient.

Hiccoughs.

Are apt to be troublesome. In the early stages a little fresh, iced champagne fully charged with gas works wonders. In the later stages the hiccoughs are signs of ammoniaemia.

Black vomit.

The treatment for ordinary vomiting should be tried. Iron has not proved of much value nor has ergot. Adrenalin by the mouth has appeared to be of benefit. All fluids should be stopped so that the adrenalin can have time to act in an undiluted state. Give 20 to 40 drops in a teaspoonful of water. Have plenty of bowls to catch the vomit, and if possible do not let the patient see it. Many patients will not notice the colour or will believe it to be bile. Do not confound haemorrhages from the gums or posterior nares with black vomit. The recumbent patient may swallow the blood and later on vomit it; this is apt to occur in the first day and will create a wrong prognosis.

Bowels.

The ordinary enemata are sufficient to keep the bowels open. Diarrhoea is liable to occur in the haemorrhagic stage, either from blood in the stomach or bleeding from the congested duodenum. The evacuations are tarry and intensely foetid. Large clysters given very slowly should be administered.

Delirium.

For mild or intermittent delirium, apply an ice-bag or pillow to the head, and enjoin absolute quiet in the patient's room. A hot bath is of service. Use as little restraint as possible. In violent delirium, maniacal patients may have to be tied down. The condition is hopeless. Bromides and chloral have been recommended.

Heart.

For cardiac weakness in the later days caffeine is best. Spartein and strychnine are of use. Alcohol is of value. Great care must be taken to prevent collapse, and especially when the bradycardia is pronounced. Ether is useful, especially if collapse is threatened through attacks of vomiting.

Complications.

Inflammation of the parotid glands is not a very rare occurrence, and is a most distressing complication. The prognosis is fair. Applications of ice are most comforting. If abscesses form they must be opened. The swelling is generally bi-lateral. Ichthyol proves of service in some cases.

Other glands may inflame and suppurate. The subjects generally have had severe and prolonged attacks of yellow fever with intestinal complications. Pneumonia is a most grave complication.

Furunculosis is very troublesome during convalescence, and several crops of boils may occur.

Management of convalescence.

Recovery must be slow and the patient will require careful treatment. In a mild case nourishment can be given even on the fourth day. Milk mixed with lime water or Vichy, or toast-water, rice and barley-water should be given in small amounts, and if well retained the amount can be increased by degrees. Chicken jelly, raw eggs, and fish should constitute the diet of the patient for the first week of convalescence. In severer cases great care is necessary to avoid bringing on vomiting. If the temperature is below 102° F. (38.9° C.) give the nourishment in small quantities. The patient must not be trusted to control his appetite; he is ravenous and will gorge himself unless prevented. Fatal relapses are usually due to indiscretions in diet. As long as the pulse is slow great caution must be exercised and exertion avoided.

The icterus should be treated by sodium sulphate waters. The kidneys rapidly regain their normal state. Convalescents are usually very erotic. They should be warned of the dangers incurred by early intercourse, while their heart muscle is still degenerated.

A few more words and I have finished. No reference has been made to any of the coal-tar products. I do not use them. If you pin your faith to these antipyretics you are only creating trouble for your patient. The older and the newer compounds have the same depressing action in yellow fever.

Educate your clients never to neglect a case of yellow fever. Half the battle is gained if the patient is in bed and under treatment within the first few hours of the onset. I cannot do better than give you the opinion of Touatre* :—'At the onset of the infection the patient can be succoured, but what can be done when the organism is poisoned, when the toxin has already affected the hepatic cells and the renal parenchyma, and when the mucous membranes are bleeding? The physician is practically disarmed, for such lesions are nearly always fatal. It is during the first days of the disease that the physician must act. When black vomit has come to darken the situation, we can yet save some patients, but are much better prepared to prevent the occurrence of black vomit than to cure it. The first and most indispensable thing for success in the treatment of yellow fever is that it be begun as soon as the disease has declared itself.'

* Touatre, Just. ; Yellow Fever. New Orleans, 1898.



Thomas, H Wolferstan. 1910. "Yellow Fever." *Annals of tropical medicine and parasitology* 4(1), 119–139. <https://doi.org/10.1080/00034983.1910.11685706>.

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