Kakke,
A Study of Disease in Japan,
A Thesis,
Presented to the University of Edinburgh,
by
In presenting to the University of Edinburgh a Thesis for the Degree of Doctor of Medicine, it has seemed to me that I could not find a more appropriate theme than some aspect of disease, which has presented itself to me in practice in Japan during a residence of nearly ten years in that country. Such a practice affords opportunity of seeing some diseases which do not occur in Europe, or are not frequent. Among these, the most important is that which I have selected for the subject of my Thesis.

The practitioner in a distant land has many difficulties to contend with. The initial one of the language of the people having been overcome, he has to deal with much prejudice and gradually to win the confidence of the people. Abroad more than at home there are difficulties in the way of keeping patients sufficiently long under observation, and of inducing them to submit to or to carry out the treatment determined upon. The field of Pathology is very much limited by the difficulty of obtaining permission for an autopsy. In serious cases one feels the absence of medical colleagues with whom
to confer, or even of a good library to consult. I may add that a busy practice of from four to five thousand patients annually, many of whom demand careful study, and many, surgical interference, does not admit of much leisure for keeping records. In my own case I had the additional calamity of losing all my clinical notes up to Nov. 1849 in a fire in which the dispensary and hospital were destroyed. I mention these circumstances as some apology for the deficiencies of which I am conscious.

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Nakke.

One is not long in Japan before hearing both from foreigners and Japanese of a
formidable and mysterious disease prevalent among the natives, known as
"Nakke." This word signifies "leg-affection" being derived from the old Japanese
word kakei, leg, and ke or ke, spirit or affection. The disease has
long prevailed in Japan, being described by a native physician as early as the
year 1562.

The recent literature of the disease as it has attracted the attention of foreign
physicians resident in Japan is as follows:

A paper by Dr. Hoffman of the Imperial Medical School in Tokio, published in
Transactions of the Deutsche Gesellschaft für Natur- und Volkskunde Ostasiens
in July 1873, never completed.

An article in St. Thomas's Hospital Reports
Vol. 11, new series, by W. Anderson, B.D.,
Professor of Medical Sciences in the Naval
College, Tokio.

Lectures on Nakke by the same author
published in Yokohama, 1879.

Klinische Untersuchungen über die
Japanische Varietät der Beri-beri Krankheit
Von Dr. A. Wernicke, published in 1879 in
The 7th volume of Virchow's Archiv für pathologische Anatomie und Physiologie.

An article on Beriberi or the Rakke of Japan by Dr. B. Schenck in the Medical Reports of the Imperial Maritime Customs of China, 19th June, 1880.

Two papers with the same title in the Pacific Medical and Surgical Journal, for Oct. 1880 and Jan. 1881 by Stuart Eldridge, M.D., Surgeon to the General Hospital, Yokohama.


All of these I have consulted except the last. All of these writers regard the disease as identical with or allied to the disease known as Beriberi. The literature of Beriberi, however, reveals such conflicting and confusing opinions, that I deem it better to consider Rakke by itself and then consider its relations to Beriberi. I'm doing so I shall first give my own experience and supplement it by the observations of others.

At the commencement of my residence none of the above mentioned sources of information were available to me.
and I had to study the disease as it presented itself to me. Many cases presented themselves under the name of Rakhe, which were simply synovitis of the knee-joint or sacroiliac of the leg depending upon cardiac or renal lesions or anaemia. Hence I became sceptical whether any specific disease corresponding to the name Rakhe actually existed. But I soon became aware of a large number of patients, who came to me with symptoms of defective innervation of the legs. They complained of numbness in the lower extremities, which they generally described as a feeling as if a piece of thin paper were spread over the skin, slight loss of power in the legs, showing itself by inability to walk any distance without inordinate fatigue, a tendency to stumble, and for the knees to give way. They experienced difficulty especially in going upstairs, and sometimes in holding the thing of the wooden clog usually worn by the Japanese, which passes between the great toe and the next. Some patients dropped the point of the foot in walking, showing a paralysis or paresis of the flexors of the foot and extensors of the toes. When the foot was planted evenly on the floor, they had little or no power to raise the toes from the ground, or if they could raise
The toes, little pocks were required to press them down. They had also a trace of edema over the tibiae or about the ankles. In many cases there was tenderness of the muscles of the calf, which were in some instances hard and swollen, in other cases abnormally flabby and apparently partially atrophied. In almost all of these patients, there was an absence or marked diminution of tendon reflex at the knee. Beyond the above symptoms they seemed to be in average good health. Some of them complained of vague dull pains in the legs. As illustration of the above, I transcribe my notes of the condition of one of them as they came to the dispensary. 

Kajiya Hiruzo, male, age 20, Aug. 30, 1882. Complains, since 20th inst. of knees giving way while walking, and numbness from above ankles to little above knees except at outer surface of legs, has no strength in his legs, he says, to grasp the close - walks without bending the knees, because if he does so much he falls. Has absolutely no other sign of ill health. (The tendon reflex in this case was not examined.)

Ike Enkichi, male, age 25, Sep. 19. Rakki. Since end of last month - especially last 10 days - walks with difficulty, can scarcely
rise from sitting position, pain in legs, pain in toes downwards, numbness from knees downwards, no fever, no heart symp-
toms, appetite diminished, tongue foul, bowels rather confined. Ten days ago had a
little gonorrhoea still has pain on urine
urination, urine slightly turbid from muscular
and bladder mucous — otherwise normal —
attitude, he, disease to anxiety.

Minabara Fulenwati, male, age 21. Feb. 4th.
Complains of difficulty in raising toes of left
foot, walks with toes drooping, turned out-
wards — slight trace of edema over tibia,
umbness in calf and feet — has feeling of
heat in left foot, and says that it feels cold
on being warmed by the fire — no tenderness,
begun to complain early in Jan. — has uric.

Furuta Naoji male, age 21. Rakki, slight
edema over tibia with hardness of muscle,
of calf of both legs, feeling of contraction
in them, some numbness, no pain, ill
since middle of October, first was unable
to rise to the standing posture without help
had great difficulty in walking, now is able
to walk 10 miles.

Such cases with slight variations might be
multiplied, in which the symptoms were
slight and confined to the lower extremities;
they do not admit of classification with any
Known disease, and can only be called
defective innervation of the lower extrem-
ties. Occasionally however they assume a
more serious form, for example: - Music
Kawasaki, 25, male, Aug. 10th. com-
plains of pain and swelling in calves of legs,
since 20th. Erection at a fire on the 5th. first,
with sense of contraction in the gastrocnemii
and ham-string muscles. The pain is only
on walking. The gastrocnenmii are hard, tense,
swollen, not tender to pressure; no rise
of temperature, but keeps he was feverish at
first, general health good, was ordered rest
and linen. Sept. 1st. Ohio. Aug. 15th. slight
improvement but has also slight redness over
tibia, and complains of tenderness in ab-
domin. Sept. 2nd. has had hi. legs bandaged,
which seems to have had a good effect, but
within the last 3 days complaints of a feeling
of constriction in chest, hi. heart action is
suggested and rapid - no murmur; has
been living in a swampy situation, order-
ed to move away to the hills.

Such cases as the above, ill-defined and un-
satisfactory as they are, form the first link
in a chain or series of cases, which will be-
come more distinctive and grave as we
proceed. The last mentioned appeared to be
one of inflammation of the muscles from
over-fatigue, yet developing the symptoms of more pronounced Rabbe, with the heart-com-
plcations which sometimes suddenly assumed so serious a form in that disease. It is this 
clase of apparently trivial cases to which Nor-
wich gives the name of abortive Rabbe.
In the majority of cases the symptoms are not 
confined to the lower extremities. Nummness 
occurs in other parts, most frequently in 
the finger-tips, the hands & arms, and 
this is accompanied by some loss of motor
power in the hands. The slight degree of 
umanesthesia may also occur in the abdo-
men or face. Edema may also appear in 
the face. Palpitation of the heart occurs upon 
slight exertion, or palpitation of the abdom-
ninal aorta, and there may be the appear-
ance of serious illness with pallor, or the 
patient may appear in normal health.
An illustration of such cases, taken from 
my note-book, the following cases.
U Athletic, Kogo, male, 35. Seen on April 16th. 1882, stated that he had Rabbe 4 years 
ago, so severely that he was unable to move 
in bed, being paralyzed in arms and legs. 
His illness lasted 100 days: he has never 
got quite regained his strength, has numbness 
of the legs, cannot walk more than 2 miles, 
his knees ache when he sits on the floor,
has very slight oedema over tibiae. His hands are normal. He suffers from palpitation on exertion, but there are no other signs of disarrangement of the heart. He complains of a feeling of heaviness in the head, and that his eyesight is failing since January last; says that his sight became bad in June of last year, and in about two months improved again spontaneously. On ophthalmoscopic examination he has posterior atrophy of the retina and signs of previous chorioiditis. Concomitances do not improve vision.

Takeda Saburo, aged 21, a strong, healthy looking lad, has slight oedema of legs, and complains of palpitation in abdomen. Excessive palpitation of abdominal, can be felt. He had Rakhi last year for the first time, and then found it difficult to walk upstairs and had slight oedema, but otherwise was well. The oedema has never quite disappeared. He has no albuminuria, heart disease or other symptoms.

Toyama Takeichi, aged 16, male, complains of pain in the ankles, and gastrocnemii, numbness of toes, and palpitation on slight exertion. He has a downcast expression, but otherwise looks well. The tongue is flabby; he complains of a sense of obstruction in the stomach after food. The heart sounds and
and pulse are good. He is an overworked apprentice.

Hawaye Kunio, aet. 15, seen April 8th. Ill since December last, complains of pains in feet, tenderness over tibiae, numbness of toes, palpitation of heart on slight exercise, occasional swelling of face; has a feeling of difficulty in respiration. The first sound of the heart is a little muffled, the action of the heart slightly irregular. Appetite good, bowels open, urine normal. Otherwise well.

Yoshida Zeitaro, male, aet. 16, has had edema of legs and face for 30 days past, with numbness of hands and feet for 10 days, has violent palpitation of the heart for the last two days; no murmur; heart's action rapid, but regular and pulse good, no albuminuria, is apparently of sound healthy constitution, has been a tailor's apprentice for two or three years, sits on floor of a low, damp room.

Kinukai Toshita, aet. 18, a strong healthy lad, complains for a month past of numbness of arms and legs, with a trace of edema of legs, and complains of a feeling of lassitude; otherwise no signs of disease.

Sato Kinbei, aet. 25, had Rakke last year; twenty days ago began to experience numb-
Mass in knees which spread down to the toes, and for the last four or five days has had numbness in fingers, toes, hands, pain in knees, ankles are stiff, no edema, no fever, tongue foul, and have feeling of distension about stomach, but appetite good, bowels regular; general health fair.

Keigama Yoshitare, age 21, has had symptom of Kakiké for the first time for the last 5 or 6 days, has numbness of legs from the middle of the thighs to the toes, and of the extremities of the fingers, pain in walking or on changing position, felt in the hamstring muscles and in the calf, also a feeling of twitching or contraction in the hamstrings which is worse on rising from the sitting posture. There is no edema, no tenon abscess of the muscles. The patient is anaemic, and looks seriously ill; had a sore on the penis six months ago, followed by suppurating bubo and no constitutional symptoms.

I regret that in the above cases the condition of the tendon reflex was not examined, but during the last year I have been careful to examine and note it in all similar cases and have found it almost invariably absent.

Ninuma Schichizo, age 43, a seller of vegetables, who carries about 165 lbs. weight of goods suspended from the ends of a pole said
across his shoulder; he suffered from Rakke first 14 years ago, and had it 4 years in succession; at one time he was so ill that he could not stand; another year the muscles of the leg were so painful and hard that he could only crawl, and his legs were edematous. Seen on Aug. 3rd, 1853, he complains of numbness of the legs, and of the skin of the abdomen, loss of muscular strength and loss of appetite. His symptoms commenced a month ago and he has been obliged to desist from work since the 13th ult. He is a strong muscular man, but has a look of exhaustion. His legs are stout, but the muscles of the calf feel softer than normal; there is no tenderness on pressure. He can scarcely walk for ten minutes, and finds it very difficult to go up stairs. The numbness is chiefly on the inner side of the thighs, he is sensitive to pain and distinguishes two points fairly well, but feels as if a sheet of paper were interposed between the skin and the object touched; there is an entire absence of tendon reflex at the knee, but pricking the legs causes an involuntary start. He walks slowly and heavily. No edema. The tongue is flabby and covered with white fur. Heart has a faint murmur audible at the afer
following the first sound, no palpitation or irregularity, otherwise well.

Fujita Seizaku 35 complains of numbness of back of leg, and at night pain on outer side of knee and inner side of thigh. From thigh downwards feels when touched as if covered with paper, especially at back of leg. Reflex knee jerk absent, no tenderness. No numbness or other symptoms in other extremities. Slighty deficient response of muscles of leg to faradis current, but becoming normal after short application. He is able to walk slowly 10 miles, but after walking the pains at night are increased. Has been in this condition on and off for three years. In other respects he is in normal health.

All the above cases are those of young men; children are never attacked, old men rarely, and women rarely except after childbirth. As an example of the latter I transcribe the following:

Hirosewa Furea 21 was delivered of her first child 25 days previously, after an eight months pregnancy. The child lived only 2 hours. She is very pale and debilitated, and has a few papules and pustules on her face. Her voice is husky and feeble. According to the custom of the country she was kept
For seven days after childbirth in a sitting position, that is, with her legs bent under her and the whole weight of the body pressing upon them, during this time her legs became numb and painful; this became worse after the 21st day, and she now complains, in addition, of a sense of twichings in the legs, and within the last few days her finger tips have become numb. There is not the slightest tendon reflex at the knee. The heart sounds are accentuated. Appetite and digestion good and in other respects she is in fair health.

Another case occurring in a woman is as follows:—Nogaki Seimu, Oct. 30, formerly a prostitute, now married, has had two children, both of whom died in infancy. One recently, she looks pale and weak, being exhausted by nursing her infant, and depressed by sorrow. She consulted me a few years previously for a painless abdominal, which from its position and shape I took to be an enlargement of the pancreas, nature undetermined, and advised her to leave it alone. It has since gradually and spontaneously disappeared. She has no signs of syphilis. She now comes with slight oedema of the legs and face, numbness of the legs, hands and abdomen.
inal surface, entire absence of tendon reflex at knee, loss of appetite, nausea, excessive thirst, pain in abdomen on walking, relieved by pressure. Her symptom commenced four days previously. No fever, icterus, no albuminuria, heart normal.
She was ordered as a rescue tonic: a mixture containing: Quin. Sulf. 2 gr. Dig. Stro chloride 3 m. Acid Phos. 10 cc. to each dose, to be taken 3 times in the day, and her limbs were to be daily paraded. After 23 days of the treatment her health is much improved in every way, but she still complains of toes, knees and tips of ring-fingers. She has now feeble tendon reflex at knee.

Such are the cases of Kaka Ke as they usually present themselves at outdoor patients at the Dispensary in Nigata. They are generally chronic, many of them state that they have previously suffered severely from the same disease. Their course is generally favourable, I usually prescribe a tonic such as that mentioned above, and have their limbs paraded. The disease however is not always favourable in its course, but the acute form if it, or acute exacerbations of it are very rare in my experience.
Rigata. I have seen three fatal cases and of these, I regret, that I have no notes, one of them was a domestic servant, a man about 35 years of age, whose symptoms were at first similar to those above narrated, with the addition that his voice-muscles were soon the first affected. After a few days he became unable to stand, and crawled into the room on hands and knees. He went on from bad to worse, and losing faith in the foreigner, he came under the treatment of a Japanese physician, who was supposed to understand better the diseases of his own nation. He lingered for a few weeks, became emaciated, now lost entirely the power of motion in his legs, now became generally delirious, but died apparently by failure of the heart.

A second case was a man of middle age, admitted into the hospital with kakki of sudden onset and severe type. He came into the hospital with the usual symptoms, scarcely able to walk, supported on both sides, distressed breathing, cardiac disturbance, and very anxious facial expression. I was called into the country and was obliged to leave my patient in the care of the native assistant, who
informed me upon my return that he had been seized with convulsions and died in my absence.

A third was a similar case to the above, brought as an out-patient, but he declined to stay in the hospital and was taken home by his friends, doubtless to die.

At the risk of being tedious I have narrated cases with the view of giving a more truthful picture of the disease as it has occurred in that part of Japan where my lot was cast. The acute cases occur more frequently in other parts of the country and are thus described by Anderson. "In the Acute form the grave symptoms may appear without warning, nearly always developing in the course of a sub-acute or chronic attack. A patient comes under treatment for Rabiki of apparently an ordinary character; he is usually well and well-nourished, has no sign of anaemia and little or no oedema; the disease progresses in the usual manner and no evil is anticipated, when suddenly rapid action of the heart, strong pulsation in the neck and difficulty of breathing appear, with a distressing pain in the abdomen soon afterwards. The patient vomits, and while an observer unaccustomed to see the disease still apprehends no danger, the

* The true character of the convulsions is doubtful.
Japanese doctor recognizes the commencement of "Shigeshin" and predicts that the man will surely die. During the next few hours the breathing becomes more embarrassed, the pulsations of the heart more and more accelerated, and vomiting recurs from time to time. The patient now can lie down no longer; he sits up in bed or tosses restlessly from one position to another; and with wrinkled brows, staring anxious eyes, dusky skin and blue painted lips, dilated nostrils, throbbing neck and labouring chest, present a picture of the most terrible distress that the worst of diseases can inflict. There is no intermission even for a moment, and unless active treatment be at once resorted to, the pulse fails, the temperature sinks, and at length the brain paralyzed by the carbonized blood, becomes inexcusable, leaving the dying man to pass his last moments in merciful unconsciousness.

All acute cases, however, are not as terrible as this. Frequently a difficulty of breathing with cardiac disturbance may exist for one, two or three days without much change, and if these signs be, at their commencement, used as a warning the progress of the condition may be arrested.
ed almost with certainty, and even in the most desperate cases the physician is not helpless." The word Shigotshin above mentioned is a term applied to embarrassment of circulation and embarrassment to a marked degree in Rakki.

A somewhat different clinical picture of the disease in its milder form is drawn by Dr. Simmons. He accepts, without qualification, the identity of Rakki with Beriberi. He makes a sharp distinction between two forms of the disease — the wet or hydroptic and the dry or atrophic variety, following in this respect the distinction made by some writers on the disease in India. The wet form he also calls pernicious, the prognosis being bad. Its distinctive feature is general anasarca. He says, "In these cases, the anasarca which, as has been stated, constitutes the leading clinical difference between the two forms of the malady, plays an important rôle. It often happens that, in the course of a few hours, the local oedema in the extremities and the slight puffiness of the face become extreme, and the acutest treune of the whole body is gorged with fluid. The cavities, especially the pleural and pericardial, suffer more or less distinction with serum,
Thus mechanically embarrasing the action of the organs they contain. The action of the heart becomes laboured, the lungs oedematous and filled with coarse scales. A terrible sense of suffocation comes over the patient, causing him to seek relief by constant changes of position. The stomach becomes irritable, and vomiting of greenish-yellow fluid occurs, this being almost always prognostic of a speedily fatal termination. The acute stage in the dry form is characterized, on the contrary, by a rapid diminution of the fluids of the body, and an increase in the existing paralysis and muscular atrophy.

I have never met with a case of Raddle with general anaesthesia, or even an extreme degree of local oedema, and therefore do not feel competent to criticize Dr. Simmon's description of it, but it seems to me that, as some degree of localized oedema is an almost constant, probably invariably present at some stage of the disease, the occasional extension or exaggeration of it, scarcely constitutes a separate form of the disease. He emphasizes however, other point of distinction between the two forms: "In the
wet form the pulse is full, large and easily compressible, showing a great diminution of arterial tone; while in the dry form there is an exactly opposite condition. In the wet form, systolic murmurs are heard over the pulmonary valves, and over the large arterial trunks. In the dry form, murmurs are either slight or wanting altogether. In the wet form, the heart gives evidence of varying degrees of dilatation and want of tone, such as increased area of dulness on percussion, intercostal pulsation etc. In the dry form the area of cardiac dulness is variable. In the wet there is sluggishness of the bowels and urine is scanty, in the opposite form there is but little deviation from the normal.

Here transcribe from Simmons a report of a case of puerperal Beriberia, as he calls it.

S. act. 26: policeman. Parents not living. father died from some chronic disease, mother from dropsy. Has three brothers and one sister living. Has never had syphilis or rheumatism, and his general health up to the present time has always been good. Entered the hospital 15th June, with the
following history:—

During the first days of May, began to feel unwell, had occasional slight chills, followed by heat flashes, a general sense of malaise, and a tired feeling in legs. By degrees these appeared much in the following order, symmetrical anaesthesia of the skin over the tibio-fibular space in both legs, gradually extending up the anterior surface of the thighs to the lower part of the abdomen, then to the tips of the fingers, the dorsal surfaces of the forearms, and around the mouth; oedema of the anterior portion of the legs between the knee and ankle; a sense of fulness, attended by occasional spasms or contractions of the muscles of the calves, slight pain in the knees and weakness, which with drooping of the feet and toes, caused him to stumble. Any considerable exertion brought on painful palpitation and precordial oppression. Bowels sluggish; urine scanty.

Present condition.—He was above the medium Japanese stature, stout, but not corpulent, muscles firm and well developed. There was slight puffiness of the face, with characteristic sallow colour of the skin. The palpebral conjunctivae were of normal hue, though the vessels...
appeared somewhat enlarged; tongue and
mucous membrane of the mouth presented
the same general appearance. Appetite fair,
but had increased praecordial oppression
after a full meal or the ingestion of
liquids. The urine was of a brownish
colour; no albumen; a very dark brown shade
was given on the addition of an excess of nitric
acid, becoming almost black on boiling.
Inspection of the chest showed distinct vibra-
tion of the inter-costal spaces over a large
portion of the cardiac area, and palpation
strongly impressed one with the violent
struggling action of the organ. Aperic
pulsa below and to the left of the nipple;
first sound entirely masked by a loud
blowing murmur, most distinct in the
third inter-costal space on the left side,
though audible at the apex; second sound
normal; carotid and abdominal pulsation
very marked. The blowing murmur
audible over the heart was common
to all the larger arterial trunks. Per-
cussion showed decided enlargement
of the cardiac dulness; pulse 109, full
and strong, the vessel feeling double
its normal size. Cardiac oppression
severe and increased by slight pressure
on the epigastrium and walls of the
Chest. Firm pressure on the spinous processes of the upper dorsal and lower cervical vertebrae decidedly painful. Muscular sensibility very pronounced, especially in the gastrocnemius and pectoral groups; later, this was observed in the quadriceps and the muscles of the anterior portion of the forearms and inner sides of the thighs. The redness of the anterior tibial regions had now become more or less general, a condition probably existing from the first, but less easily demonstrable.

17th. June.—Pulse 104. Feels worse. What better, a saline purgative having been administered early in the morning.

18th. June.—Pulse 98. Feels worse, and complains very much of the violent action of the heart, even while at complete rest. A sudden fall of the temperature had occurred with rain within the last 24 hours.

20th. June.—Pulse 90. So somewhat less oppressed in consequence of active purgation and draining away of fluids, but he is weaker.

21st. June.—Pulse 89. Heart's action still violent. Vomited about 12 oz. of greenish-yellow fluid, which appeared to give temporary relief.

24th. June.—No material change since last note; gradual loss of strength; increasing
An anaesthesia, especially of the face, skin becoming of a leaden hue. 25th June—Pulse 110. Vomited several times today, and is rapidly sinking. Is very restless, constantly changing his position in vain attempts to obtain relief from the sense of impending suffocation. Crepitation rales appeared in both lungs. The pulse rose to 120, and then disappeared at the wrist, the extremities became cold, and at 12 M. he died rather suddenly.

An autopsy was obtained in the case, which will be given later.

This completes the clinical account of the disease, but the symptoms must be considered more in detail. The most prominent and important are those which are referable to the nervous system.

Anaesthesia of the skin is almost invariably present, is never complete, and is always localized. It always commences in the lower extremities, where it also persists longest, tends to spread upwards to thighs and abdomen, often suddenly appears in finger-tips or hand, or around the mouth, and, in other situations than the legs, is fugitive in character. I have found attempts to measure the degree of anaesthesia un-
satisfactory. Dr. Vernier has however elaborately tested the sensibility of the skin. He says, "I tried to elucidate the specific sensory disturbances by clinical research to the best of my ability. Indeed there has been hardly one case in which I have not tried all the tests for the most common varieties of sensation. The results are as follows. Analgesia in 25 per cent. A prick or scratch or strong faradic current touches were felt only as touches. At the same time, half of these patients felt pain if along with the skin, the subjacent structure was pinched. Sense of locality according to Weber’s method with a pair of compasses was in most cases not sensibly diminished. During the course of prolonged examinations patients sometimes stated differences in the size of a circle, but these were less intelligent patients whose attention soon failed. A diminution in the sense of pressure was noticed only in eight patients or about 6 per cent of the cases. All these had had the disease already several times and stated, on being questioned, that never after had they recovered acute sensibility in their legs. All the other patients distinguished weight, from 60 to 70 grams, and upwards with..."
normal precision. The sense of temperature was nearly always affected, namely, in 82 per cent and this, already in the earlier stages. With peculiar accurateness the patients were able to feel the percussion hammer or any other cold object as being much colder at the normal portions of skin than where they were anaesthetic to touch. Also hot objects were distinguished with much more exactness at normal portions of skin, whilst in the anaesthetic regions when the temperature was raised above 45° or 46° C. indistinct sensations of pain were felt, caused by the contact of the hot object.” Anderson observes “The degree of impairment of tactile sensibility is found by the aesthesiometers to vary from 25 to 75 per cent of the normal acutenesses.” It has seemed to me that the subjective numbness of complained of by Rabbe’s patients was in excess of the objective, that is, that the diffused sense of alteration in cutaneous sensibility was greater than could be demonstrated by endeavours to test it. It is important to note that the anaesthesia is symmetrical in character.

The special senses are not affected. Norrich however remarks “They say that taste is somewhat diminished, even when the
stomach is not affected. There is no hyper-
asthesia at any stage of the disease, except
the tenderness of the muscles.
Loss of motor power. This too is a constant
symptom also commencing in the lower
extremities and chiefly confined to them,
ever becoming absolute. Most frequently
the gastrocnemius and the quadriceps
femoris are affected. The paresis of the
rectus femoris is shown by a tendency to
fall forwards on the knees when bent, a
sense of looseness in the knee-joint, and a
feeling of concussion on the condyles when
walking, due, no doubt, to the deficient
tone of the muscles which fail to keep
the articular surfaces well together. Some-
time it is especially the muscles which
flex the foot which are weakened and
then the peculiar gait is observed in which
the patient lifts the feet high to avoid
dragging the toes along the ground, or to
relieve the weakened muscle, the work
being thrown upon the flexors of the knee.
It is this probably which has led to the
name beri-beri in India, if, at least,
the suggested derivation be correct, viz-
pom the Hindustani word, Berēēē-ahsheep,
from the fancied resemblance of the gait
of persons affected to that of sheep.
This loss of motor energy, like the anaesthesia also appears in a less degree and less frequently in the upper extremities, and perhaps often escapes notice. A curious fact analogous to that of the anaesthesia appearing about the mouth, is that the vocal muscles are sometimes affected, and I have noted one case in which the muscles concerned in articulation were interfered with, the patient complaining that the distinct enunciation of his words required effort. The sphincters are never affected. The degree of muscular weakness varies. In the lowest degree it is inability to walk more than a short distance from a sense of fatigue, which may become aching in the muscles; then the patient may be unable to walk but can crawl. He may have only the power of moving the limbs as he lies in bed. When the disease has lasted long, the muscles atrophy and the paralysis becomes complete. Anderson found that the average loss of strength when the patient comes under treatment is about 60 per cent as tested by the dynamometer. That this symptom is not due to mere malnutrition of the muscles is evident from the fact of its occurrence
in well-nourished patients. It is, besides, localized to certain groups of muscles, and is symmetrical.

Like the condition of the muscles, in some cases the muscle of the calf are tense, swollen and tender as if they were the seat of inflammation. This condition subsides and leaves them flaccid and softer than natural, though the tenderness may remain. In other cases the muscles seem to become soft and tender and undergo more or less of atrophy from the first. This is generally completely recovered from, but Anderson mentions some cases in which a permanent atrophy of a certain group of muscles remains.

As an illustration of a case in which muscular atrophy was the most marked symptom I quote the following from Simmons.

Benignia Atrophia.—Mrs. M., aged 33 years, wife of an officer of the better class; resides in an elevated, well drained locality on the side of the bluff facing the town. Was confined with her second child on the 1st July, 1873. During the last months of pregnancy had experienced a sense of weight in the lower extremities, and shortness of breath on exertion, more marked than while carrying her other child. Delivery was normal,
child well-formed and apparently healthy, but it died in three days from causes unknown; the mother's milk disappearing without trouble. During the subsequent ten or twelve days, she frequently complained of constriction of the calves of the legs, and more or less pain on pressure or forced movement in the muscles of the anterior part of the fore-arms. Occasional feelings of oppression in the pia-cordia, and slight palpitation were also noted. On attempting to stand at the end of the twelve days mentioned, she found herself quite unable to do so. Her condition from this time became steadily worse; she suffered little when quiet, but muscular movement produced pain. On the 1st. September, two months after confinement, she was admitted to the hospital, completely helpless, not being able to extend or flex a limb, or move from side to side unaided. The muscles of the extremities were extremely atrophied, the anterior tibial muscles were paralysed, while those of the calves were much contracted, bringing the foot into a complete talipes position; the dorsal muscles of the fore-arm were paralysed, and the palmar contracted, bringing the fingers tightly into the hand. Any attempt
made to rectify these abnormal positions was productive of great pain. The pulse was small; the heart apparently contracted and acting feebly, and there was present the metallic sepulchral ring of chronic cases. Tongue clean, appetite fairly good, bowels slightly constipated, urine normal in quantity and quality. She complained of nothing but some constriction of the chest, and palpitation, these varying in degree with atmospheric changes. At this time I took with the forceps, several specimens from the muscles of the calf and from the tibial anticus for microscopic examination. These showed extreme degeneration of the muscular elements. A variety of means were with but little success resorted to for her relief, including electricity, stimulation, iron, friction, and so on. At the end of two months she was transferred to an invalided resort in the mountains, the result being most satisfactory—a change immediately taking place for the better. Four months later she again entered the hospital being now able to raise herself to a setting posture and change her position in bed, while the rigid contracted condition of the muscles had partially disappeared, one finger only, the little one, remaining tightly
bled. The former extreme stiffness of the muscles had been followed by a considerable increase of their bulk. Specimens again taken with the horsepow demonstrated a partial restoration of the primitive muscular element. After remaining a month longer in the hospital, she returned home. After remaining an improvement continued during the following summer and winter months, until she could be up and walk about.

In the meantime she again became pregnant, and in June 1874 was delivered of a healthy child. With the event the old symptoms returned. Paralysis and atrophy of the partially restored muscles of the limbs followed, and at the end of two weeks she again entered the hospital. Her condition was not so bad as on the first occasion, as she could turn over in bed unaided and to some extent move the limbs. The heart symptoms were the same. Remembering the benefit gained by her sojourn in the mountains, she again spent several months there, with the same decided benefit. Early in the spring she returned home, and, to my surprise, could walk with comparative ease, though unable to quite bring the heel to the ground, in consequence of some remaining contraction.
of the muscles of the calves. The whole body, including the extremities, was plump and well-rounded, and she appeared as well as before her first attack. During the following summer, she again became pregnant, and her confinement was followed by a third se- lapse, but in a much milder degree. From this she readily recovered, going at once to the mountains, and remaining until well."

It is necessary to add that the above is an exceptionally extreme case of muscular atrophy, and it is highly probable that, though oedema and anaesthesia of the skin are not men- tioned in the report, they occurred at an early stage of the disease, before admission into hospital and were not noted by the patient.

I regret that I have not exact observa- tions to offer with regard to the electrical reactions of the muscles. I never applied electricity to them in their tense condition; in their flaccid condition there seemed to be a diminution of their excitability by the paraly- cements. Anderson remarks "In the ordin- ary form the sensibility of the muscles to Faradism and Galvanism remain un- impaired, indicating the central origin of the paralysis", and in cases of marked atrophy he says "as atrophy progresses
The electrical reactions become increased." Simoons remarks, "In all the electrical experiments made on the voluntary muscles the degree of excitability was in the inverse ratio to the pathological changes they had undergone. Vernier observes, "Elective excitability of the muscles is in direct (he probably means inverse) relation to atrophy of muscles, but it must be stated that there is a brief period when the excitability is increased. This comes on with diminution of the amaurosis. If a short time previously strong paralytic current show it much diminished one is apt to rejoice at finding reaction developed again as the amaurosis goes, but the atrophy is by no means at an end with the amaurosis, on the contrary it sometimes seems then first to come on in full force—probably because in the spinal canal and nerve-roots receptive or other processes may come into play, entirely different from those in the subcutaneous connective tissue. Hence from day to day excitability diminishes, and atrophy goes on."

Patients often complain of twitchings or contractions of the muscles, but I have never seen anything deserving to be called 'cramp'. I suppose them to be either subjective or fibrilla. There are no tremors...
or choreic movements. Superficial reflexes appear to be diminished in proportion to the contractures. Tendon reflex at knee, in those cases in which I have examined it, is almost invariably wanting. There is no impairment of coordination. Cases of locomotor ataxy occur of same type and about the same frequency in Japan as in Europe, but I have never seen any connection between it and rabiki. There is no pain referable to the spine, nor have I found tenderness on percussion over the vertebrae. Well-marked girdle-sensations do not occur but patient occasionally mentions a sense of constriction when asked. There are no cerebral symptoms, on the contrary I have always found the pain perfectly clear. Werních mentions a degree of mental dulness. There are no signs of inflammation of nerve-trunks. Bedsores, I believe, never occur. The functions of the bladder and rectum are never interfered with. Werních mentions that in cases of extreme anasarca, after it has disappeared the skin gets dry like parchment and loses its downy hairs.

Next in order of frequency and importance are the symptoms of disturbance,
of the circulation. We shall consider first the blood itself. This has not in my experience presented anything characteristic. There is almost unanimity among observers of the disease in Japan, that anaemia is not an essential nor important element in the disease, and this is in remarkable contrast with the views of writers on the disease in India, who held that it is due to hydroaemia and a scrobutic taint, and is a disease of debility. According to Anderson “In the cases occurring in the Japanese navy not more than 5 percent show signs of anaemia, and even when the complication is present, it bears no relation to the severity of the special symptoms.” Eldridge says “Anaemia, properly so called, rarely exists in Bencher same as our accidental complications.” Simmons suggests that anaemia when present is rather the result than the cause of the disease, and remarks that treatment directed to anaemia is wasting precious time and hangs often a disastrous result.

Dr. Wernicke has however propounded the theory that the disease is essentially a decomposition of the blood—"Blutdecomposition" and bases this in part upon his microscopic examination of the blood. He admits that
The red corpuscles appeared not to be different as regards their number and form from those of normal blood at least during the incipient stage and in less severe cases. Whereas, in more advanced cases, the size of a single corpuscle was markedly less than the normal. Besides, the corpuscles in these cases exhibited a distinct strawberry-like or morning-star form, with little projection, or point, and never assumed the form of rouleaux. He remarks that the blood had a less vivid colour, but was not particularly watery. Under the microscope the white corpuscles were not altered nor increased in number but here and there scattered between them were pink, granular, pale yellow, finely shining masses were visible, the circumference of which exceeded in magnitude the size of a white corpuscle. A closer observation shows that there is nothing characteristic in all this. In reply, it is sufficient to quote from Gulliver in his Lectures on the Blood. After pointing out what a sensitive viscometer the corpuscle is, he says: "You may still see the corpuscles quite flat, rather tumid, like a circular or oval cup, stellate, notched, granular, crescentic, angular, lanceolate, comma-shaped,
sigmoidal, fusiform besides other varieties, defying definition. Hence one is often seriously informed how some person has discovered that they are either mulberry-shaped, star-like, indented like a cog-wheel and so forth; and the authors of such observations are not always satisfied when told that the regular corpules may and do change their shape by puckering, shrinking or becoming corrugated into such figures, or swelling out into others, while some like forms may be produced merely by the action of saline solutions of certain specific gravity according to the effect desired? I have myself observed a similar condition of the blood in patients who had no symptoms of Rakke.

Cardiac symptoms are absent or trifling in the more chronic and mild form of the disease. Palpitation and visible pulsation are the most common symptoms, occurring either on slight exertion, or, in more cases spontaneously. Palpitation occurred, Audeman says, in 60 per cent of his cases, Eldridge says almost invariably. He says the heart impulse is widely distributed, abnormal sounds are heard suggesting valvular derangement, while both palpation and auscultation detect at the cardiac base
and for some little distance above that point a peculiar semi-metallic pursuing thrill, when clearly distinguished is of itself sufficient to establish a strong presumption act diagnosis. I have never found in the disease as it presents itself on the West Coast any pathognomonic sign in connection with the heart, the more severe forms of it rarely occurring, and where heart-complications exist, the other symptoms of the disease are already well-marked. Besides, the palpitation, irregularity to a slight extent, and rapidity, sometime, an indistinct character of the sounds at the base, sometime, an accentuation, sometime, a faint murmur I have noted, but never any sufficient evidence of organic change. In the more serious forms of the disease well-marked murmurs, degeneration of the muscular fibre of the heart and dilatation of the organ appear to take place.

The condition of the arteries indicate, disturbance of the vaso-motor centre. Throbbing of the vessels of the neck is a not infrequent sign in acute cases, and is of ill omen. I have noticed excessive throbbing of the abdominal artery. In the cases which have come under my notice the pulse when it has perceptibly departed from the normal has been
soft and weak. Dr. Wenrich has made laborious and careful observations with the sphygmograph. In his tracings taken in typical cases of Rake's the upstroke is rectilinear and high, indicating free and sudden ventricle-contraction, the apex is acute, the line of descent is more rapid than normal, neither the tidal nor diastolic wave are well marked; in many of them there is only one wave, representing partly the diastolic notch and wave, so far resembling, as he says, cases of aortic incompetence, not due however to that cause, but probably due to or explicable by deficiency of reacting power in the arterial walls. As he observes, "in more severe cases the pulse-curve assumes the form which custom suggest a great flatness and deficient elasticity of the arterial walls."

To be considered with the other disturbances of circulation is the oedema. This I believe to be a constant symptom of the disease. It is often transient and slight in degree and therefore easily overlooked. It is an early symptom and generally appears first in the subcutaneous tissue of the front of the leg, which is slightly on pressure over the tibia. The next most common situation is the face, not about
the eye-lids in particular, but giving a general roundness and fulness to the face which in young men gives them a girlish appearance. Like the anaesthesia and the muscular paralyses, it is asymmetrical. It occurs independently of cardiac, renal and anemic complications. In some cases it assumes an alarming degree, becoming general anaemia, and coming on suddenly as edema of the lungs, or serous effusion in the pleural cavity, may be rapidly fatal. These are such striking and important features in the disease that they have been made to constitute a separate variety of it, and Simons states, "As a symptom of beriberi cholera is confined to the wet form of the disease." This I believe to be incorrect, and misleading in the consideration of the pathology of the disease.

Affections of the respiratory organs occur only in the later stages and grave forms of the disease. Laboured breathing amounting to oedema may occur with palpitation of the heart and physical signs of edema of the lungs or pleural effusion.

Arrangements of the alimentary system are as a rule not present. There never been anything more serious than slight
catalepsy of the stomach. The vomiting which occurs towards the end of fatal cases would appear to be of nervous origin. Anderson remarks that it is chiefly characterized by the absence of signs of common gastric irritation and by its constant association with shortness of breath, precipitation and other bad symptoms. It is sometimes sympathetic, repeated at long intervals and seemingly without influence upon the course of the disease; in other instances frequent, very distressing, and associated with severe abdominal pain; and in a third set of cases, those with pulmonary oedema, apparently acting in aid of the violent efforts which the patient makes to relieve his choked air passages of escaped fluid.

Scurification of urine present, nothing characteristic. It is diminished in quantity when chesty is well-marked, otherwise normal. Albuminuria does not occur, except in rare instances as an accidental complication. The skin is generally dry. Wernher remarks: "Such patients perspire only in agony under exacerbating palpitation or but very rarely after diaphoresis. They perspire, one may say internally."
The epidemic was cool and dry, at times; when as in July and August it came pouring down from our bodies and during examination of patients would not allow our hands to be quite free from it, their epidemics felt like thin Japanese paper. No scales came off, no desquamation, no ulcers.

Reproductive organs are not specially affected. I have noted one chronic case in which the patient complained of diminution of sexual power. This usually occurs as a result of the general debility, without any special affection of the organs or their nervous centre.

Temperature. All observers of the disease are agreed that it is non-febrile. I have once or twice noted a rise of temperature to a trifling degree at the commencement, and occasionally patients have complained of a slight chilliness before coming under treatment, but as a rule the temperature is normal or sub-normal.

In the Naval Hospital Anderson found elevation of temperature in one per cent of the cases.

Cf. Frequenty, the statistics of my own dispensary and hospital would not be of
any value because in my practice eye-diseases and cases requiring surgical interference have preponderated in proportion to their frequency in the general population. In a disease known to be peculiar to Japan many prefer to consult a physician belonging to their own nation. The naval and military hospitals can furnish reliable information. Those together for the year 1875 quoted by Anderson give 3.8 admissions to hospital out of the total force; but, including slight cases not admitted to hospital, the total proportion is 26 per cent. These figures refer to Tokyo. In the military stations in the south of Japan the percentage of admissions is also 3.8, that of the whole number reported sick from this cause, 33 per cent. In one of these stations among 3,445 men 1,844 cases of the disease appeared during the year. In Sendai on the last coast, a similar ratio is reported. In the Naval Hospital the cases of Rabies being classified as sub-acute, chronic and acute, their relative frequency is represented by the figures, 67, 16, and 17.

Mortality: The statistics of the Army department show the number of deaths in 402 cases treated in the Hospital in
Yedo during 1875 to be 89 or 22.13 per cent. and 25 men, or 6.25 per cent. were discharged from the service as invalids. In the Naval Hospital in 590 cases treated from 1874 to 1878 (inclusive) the death rate was 5.5 per cent, the highest rate being 8.6 per cent in 1875; the lowest, 5.2 per cent in 1877.

The Army returns for the whole of Japan in 1875, a fairly average year, show a mortality of 17.65 per cent. of the cases treated in the Hospitals (the more trifling cases being attended to elsewhere). The highest rate was 30 per cent, the lowest 13 per cent. (Anderson). Of the 216 cases admitted into the Police Hospital in Yokohama in 1871 (whole force 300), 11 only were fatal, about 5 per cent. (Simmons).
Mozid Anatomy.—Although the number of victims of Rabies every year is large, owing to the extreme difficulty of obtaining permission to open the dead body in Japan, very few opportunities of ascertaining the morbid anatomy have occurred. I have been able to find only five records of autopsies, two by Simmons, and one by Anderson, and one each by Wramsh and Eldridge, which I shall here give in extenso in that order.

The first case is that of S. act. 26, policeman, whose history has already been given. Autopsy, 24 hours after death. — Rigor mortis wanting. Eclamyzed, purplish spots from the size of the finger-nail to that of the hand over the whole surface of the body. Tympanitis inconsiderable. Subcutaneous areolar tissue gorged with serum. Intestines moderately distended with gas, colour bright pink, from capillary congestion, and very translucent. Reni and the solitary glands appearing from the outside with a distinctness rarely observed from within. Peritoneal cavity contained about 12 oz. of clear fluid. Lungs oedematosus. Left pleural cavity contained 13 oz. clear fluid, right 5½ oz. Pericardium contained 2 oz. of the same clear fluid. Right auricle contained
a large firm clot, filling a 2 oz. graduated glass; one half of its surface covered by a firm, white fibrinous substance one-eighth of an inch thick. Right ventricle contained an elongated hourglass-shaped clot, extending through the valve into the pulmonary artery, and in the first and second ramifications of the vessel were small emboli, appearing as if recently detached from the main clot. This was beyond question an autemortem clot as indicated by its extreme firmness and by the behaviour of the heart during life. A still further proof of this was the fact that a microscopic examination of the white fibrinous portion revealed a capillary network containing blood-corpuscles not only on its surface, but penetrating its substance. I am aware that this is not only rare but regarded as impossible by some observers. The left side of the heart contained a small quantity of feebly coagulated blood only. The cardiac valves were all examined with care and showed no signs of disease. Weight of the organ when empty 14.7 oz. The ventricles were dilated, their walls attenuated, and the whole
structure wanting in that degree of firmness proper to the normal heart. Microscopic examination demonstrated the muscular substance to have undergone degenerative changes. Stomach contained 2 oz. of a greenish yellow fluid; it, mucous membrane showing a number of dark red and purplish spots, giving it a mottled appearance. Spleen small and firm; weight 5 oz. bds. Liver presented no marked abnormal appearances; weight 5 1/2 oz. Kidneys: weight 5 1/2 oz; dark in colour; capsule free.

Case 2. was that of a young man with general anaemia, complaining of presordial oppression, palpitation, weakness in the legs, and anaesthesia, pulse soft and full ranging from 90 to 100. Temperature normal or a little below it. Dyspnoea, coarse bronchial rales heard over whole chest, dulness on percussion at base of lungs, especially the right. A loud systolic murmur at the base of the heart. Following day pulse 110 and very feeble, intense dyspnoea, enormous edema about the neck. The paralysis of lower extremities, somewhat less than at earlier stage. Two days later, the symptoms becoming more intense, he expired, the mode of death being by
asphyxia and paralysis of the heart from over-distension.

Post-mortem examination, 24 hours after death. — Rigor mortis wanting; excessive general sedation, most marked, however, in the upper portion of the body. The recti presented a peculiar black-greenish colour throughout their whole breadth and length, while the muscular tissue in all other parts of the body preserved its normal pinkish colour. The external appearance of the intestines was somewhat peculiar, some portions showing a bright red carboxy-ent injection, while others were mottled with greenish-grey spots. The peritoneal cavity contained 75 oz. of clear serum. The mucous surfaces of the stomach and intestines exhibited marked signs of congestion throughout their whole length. Lungs: serous and cut surfaces somewhat dark, but otherwise apparently normal; weight 56 oz. Kidneys: capsule free, general appearance normal. Spleen: rigid and appearance normal. Right pleura adnexent throughout its whole anterior and lower portion, the remaining portion contained 14 oz. of serous fluid. Left pleura entirely free, its cavity containing 27 oz. of clear serous fluid. Lungs: both exceed-
ingly redder than a porty, neo-sanguineous, test fluid flowing from their cut surfaces, quickly forming considerable pools on the table. Heart: Pericardium free, showing no sign of inflammation new or old; it cavity contained 1/2 g. of clear serum. The organ was large and remarkably flaccid, its tissue softened and of a dirty yellow colour. The unusual size of the heart appeared to be due to excessive hypertrophy. The right side contained a small amount of semi-fluid blood; left side empty. Endocardium and valves apparently normal. Microscopic examination of the muscular tissue of the organ showed it to have undergone primary degenerative changes, indicated by the indistinctness of its striations, and in many parts, their entire obliteration by fine granulations. All the large venous trunks were enormously dilated and filled with clotted blood (accounting for the lateral swelling of the neck always present in the last stages). The secondary divisions of the nervous system, as far as could be traced, were also markedly distended and engorged with blood. Brain: a small amount only of sub-arachnoidal effusion of serum existed;
external appearance of the brain and its membranes otherwise apparently normal. The ventricles contained little or no fluid; cut surfaces of the brain substance firm and apparently normal. The spinal cord was removed with great care. Sub-arachnoid effusion of reminiscence considerable. The nerve substance being exposed, and a stream of water gently poured over it, a partial disintegration and separation of its lamellar portion followed. Sections from the remainder of the cord, hardened in the usual manner, were subjected to a microscopic examination, and appeared perfectly normal.

Dr. Anderson's case is as follows. The patient, a strong, healthy man, aged 23, without a sign of anaemia, was admitted for sub-acute haeckè. A few days after coming under treatment he was suddenly attacked by dyspnoea and anxiety, with pain in the epigastric and hypochondriac regions, and vomiting. The dyspnoea and pain gradually increasing in severity, causing terrible distress, and the vomiting recurring at frequent intervals, the ejecta, at first chiefly bilious, afterwards became frothy and blood-stained, and appeared to come in great part from the air-
examination of the thorax revealed signs of oedema of the lungs, but there was no evidence of pericardial effusion. The pulse slowly failed, becoming imperceptible at the extremities, while the carotids still throbbed visibly. The temperature sinking until just before death, it reached 93°. Consciousness remained almost to the last. There was no purging. Death occurred at the end of twenty hours from the commencement of the acute symptoms. The post-mortem examination was performed fifteen hours afterwards. The chief points revealed were as follows:—

General aspect.—Body muscular and well nourished, rigor mortis well marked. Face dusky, lips blue, integument of trunk and lower extremities stained of a purplish colour, chiefly but not entirely in dependent positions.

Lungs.—Bronchial tubes and air cells contained a large quantity of puffy fluid. Parenchyma clotted and sequestrated. Larger vessels loaded with dark fluid blood. Pleurae normal.

Circulatory organs.—Pericardium contained about 2 oz. of clear fluid, and a flat, dark blood coagulum about two inches in diameter. Veins strongly
Congested.

Heart.—Muscular substance firm and healthy; valves normal. All cavities contained clots, that on the right side large, soft and dark, on the left side smaller, firmer and partly degenerated. Muscular fibre free from all trace of degeneration.

Digestive organs.—Stomach contained some frothy fluid and a little milk that had been swallowed shortly before death; large ecchymoses were seen in two situations beneath and in the substance of mucous membrane. On microscopical examination the surface was found to be completely demeubled of epithelium, and the vessels of the muscular and sub-mucous coat were gorged with blood.

Intestine.—Aspect highly congested, contents fluid and of a dirty yellow colour, but not in very large quantity. Sub-mucous ecchymoses in two or three situations in the upper part of the small intestine. On microscopical examination the surface was found to have lost its epithelium except where inflected into the Lieberkühnian tubes; the vessels were extremely distended with blood; and the involuntary muscular fibres and Meissner's ganglia were unusually distinct.
Liver, spleen and pancreas congested. Peritoneal cavity contained no effusion.

Nervous system—Brain—Membranes somewhat congested; no effusion beneath membranes or in ventricles. Brain substance normal in appearance and form on section. On microscopical examination no changes were found in the nervous structures, but the capillary vessels were unusually distinct, though empty, and were collapsed in a very irregular manner, as if after great recent fixation.

Medulla oblongata and cord—Membranes congested; two blood extravasations of considerable extent were present on the outer surface of the clava matter in the cervical region. Condition on microscopical examination similar to that of brain. The proper nervous details were perfectly normal. The various sections were preserved for ordinary histological demonstrations.

Nerve trunks of limbs normal. Solar plexuses and semilunar ganglia apparently healthy.

Urinary organs. Kidneys somewhat congested.

Bladder contained a small quantity of urine which was free from albumen. Blood dark and fluid in organs.
coagulated in terminations of sanae cavae. No peculiarities seen on microscopical examination. Proportion of red and white corpuscles not abnormal.

Eldridge's case is thus reported:—The subject was a prisoner in the jail at Hakodate, and succumbed to the acute diarrhoidal form of the disease, his immediate cause of death appearing to have been pericardial effusion. This was one of the first cases which came under my observation.

Anus area, general tone in dorsal and lumbar regions; muscles well developed and of good colour; skin much roughened.

Cranium.—Stomachis much congested, blood very fluid, a condition afterwards found to prevail throughout. Slight effusion of yellow serum beneath membranes. Cerebral parenchyma edematous, ventricles contain an abnormal amount of yellow serum.

Spinal Cord and Canal.—Much deep yellow fluid through whole length of canal and its membranes apparently normal, save in lumbar region where the membranes were intensely congested and the cord itself enlarged and softened to make its removal a matter of difficulty.
Thorax—Much deep yellow serum in both pleurae, no adhesions, left lung solidified by pressure, due both to the pleural effusion and to that in the pericardium, the latter containing some two quarts of the generally present yellow serum. Heart enlarged, dilated and hypertrophied, ante-mortem clot in left ventricle, right heart and venous system generally enormously distended with fluid blood, muscular tissue of heart soft.

Abdomen.—Some two or three quarts of yellow serum present. Liver enlarged to nearly double usual size, pale and marbled in section. Gall bladder, stomach, intestines, pancreas and kidneys apparently normal, spleen enlarged and softened.

Microscopic examination of the softened portion of the cord showed great distension of the capillaries, with many small extravasations. The heart tissue was fatty, as was that of the liver.

(It is impossible to say to what circumstances, independent of the attack of Reilken the disease of the liver may have been due, as I could obtain no history of the case antedating the final illness.)

The following is the case in which Weiii obtained a post-mortem examination
Hirakawa, aged 26, from a country of Japan. His father died after gastric disease, mother after regime of apoplexy. Strongly built, never ill previously. Has felt ill since the end of Jan. 1875, complaining of unpleasant feeling in the epigastric region, oppression of chest, increased secretion of saliva and epigastric troubles. In July to these symptoms were added great weakness in the lower extremities, palpitation after movement, bad appetite, the sense of oppression in the epigastric region became stronger and very troublesome. Since Aug. 12th all the symptoms became worse and frequently disturbed his sleep; vomiting occurred once or twice in the day. Aug. 19th. Patient very anaemic, complexion grey and cachectic, speech rendered difficult, dyspnoea always present, very frequent palpitations, skin everywhere thin and dry, muscles flabby, face sallow, eyes sunken; several times every day vomiting occurs. Patient is very restless, when lying in bed; walking and standing possible only a few moments with support. Both the lower extremities completely, the upper in less degree anaesthetic, bad appetite, diminished urinary secretion, 250 gr. to 100 albuminuria, defecation difficult. The movement of the heart cause trembling
or shaking of the whole anterior wall of
the thorax to a considerable extent, although
the hand when placed upon the apex notices
only a slight beat, pulsations of the carotid
arteries are considerable, even enormous,
and are continued up into the posterior
auricular arteries. Pulse, 96 per minute,
wave high but easily compressed. Pulse of
radial artery small, tension slight, every
new pulse-wave is preceded by a slight
wavelet, perhaps followed. The apex
beat lies somewhat away from the left
mammary line. The cardiac area below is
somewhat greater in the transverse diameter
than normal, extends to the left about a
centimetre beyond the mammary line. Cardiac
dulness is distinct as far as 5 centimetres be-
yond the right border of the sternum. (Hence
dilatation of right ventricle) Heart sounds at
apex almost hearable as the aorta a blowing mur-
ner is heard which extends over both phases of
the pulmonary artery sounds sound is heard but
weaker...... During the following days dys-
pepsia and vomiting being continued, attacks
of very violent precordial pain occurred which
were relieved with difficulty, with weak in-
jections of morphia and caustics: three or
three times vomiting of yellowish material;
the anaesthesia is now complete; more-
ment, quite impossible; urinary secretion stopped. Temperature 37.1°, pulse 104. Inspiration 32-36. Aug. 24th. Slight effusion in the pleuræ on both sides, more marked on the left. Pultrusions of the visible arteries considerably increased. Patient lies on left side. Toward evening consciousness remaining, but somewhat weakened, very slowly slight cyanosis of all the visible mucous membrane, and at 9 p.m. death supervened. The sounds of the heart and asphyxia arising it in.

Dissection 14 hours after death. Very marked rigor mortis, especially of the upper extremities. On thorax traces of cupping and other depilations, and the face still distinctly cyanotic; the skin very dry, scarcely any adipose tissue, and flabby. Muscles pale and flabby, the thorax and abdomen soft, infiltrated with fluid, but no fatty degeneration. In the abdomen 200-240 grammes of amber-coloured transparent liquid. Diaphragm is normally placed. Both pleuræ together contain about 500 grammes of amber-coloured serous fluid. Pericardium contains 50 grammes of clear yellow fluid. The parietal and visceral portions show in some places tenacious opacities and thickenings. The heart, after is formed to
an equal extent by both ventricles, appears completely rounded. Muscular fibres of left ventricle are of normal thickness and texture, whereas the wall of the right ventricle measures only 5 millimetres in thickness, is somewhat pale and yellowish in transverse section. On microscopic examination, distinct transverse striation is seen, but at some places there is granular fatty degeneration, but never to such a degree as to render the muscular texture entirely invisible. In the left ventricle and right auricle great masses of coagulated dark red blood. In the right a clot with pale surface, the mitral valve flaps are delicate, not abnormal. The aortic valves normal. Tricuspid valves and pulmonary, likewise no alterations whatever. Left lung adherent nowhere, containing air everywhere, surface partly pinkish, partly slate-coloured, the lower lobe are strongly hypostatic, bronchial mucous membrane covered with a pretty abundant white reddish mucous. Right lung in similar condition. The lower lobe not quite so hypostatic, slightly stuck between the middle lobe. The spleen small, firm, but somewhat pickled, the capsule delicate, somewhat roughened, the substance contains much blood, too
Aceneae distinct. A solution of iodine yields no amyloid reaction. Left kidney of normal size, capsule may be taken off readily, surface smooth, substance shows distinct markings on section, boundary lines normal, cortical substance congested, no reaction with iodine. Right kidney exactly as left. Stomach somewhat contracted, very pale, contains little grey brownish chyle. Considerable injection of mucous membrane around the pyloric end. Here and there ecchymoses and slate coloured discoloration along the great curvature. Liver strongly hyperemic; gall-bladder contains 200 grms. greenish black bile. The surface shows in some places whitish yellow fatty degeneration especially on the under surface of the right lobe. In section yellow appearance is seen with some red spot, scattered over it. Weight of entire liver very considerable. No reaction with iodine. No enlarged mesenteric glands. The peritoneum somewhat hyperemic. Pancreas firm and dry, colour normal. Duodenum ligament, nothing worthy of note. Stomach chiefly hyperemic, nowhere ulcerated or swollen. In the lower portion were dark patches resembling haemorrhages, also found in cæcum. Bowel much congested.
Bladder contains about 30 gm. urine, normally.

Having thus collected all the available facts, clinical and post-mortem, which can
shed any light on the subject, it remains
for us to consider the pathological process
and to look for any possible causes of it.

In the first place, no one will doubt that we have to do with a disease in
which the motor, sensory and reflex functions
of the spinal cord are impaired, and we
should therefore look to the anterior and
posterior cornua of the grey matter of the
cord as the seat of morbid change.

In the autopsies recorded the condition of
the spinal cord is noted in three cases.
These of course do not furnish sufficient
data upon which to found final con-
clusions, especially when we remember
how early fine lesions in the spinal
cord may be overlooked, and that it is
desirable to have the microscopic examin-
ation conducted by special experts in
pathology. In Dr. Anderson's case which
was acute, and might almost be called
fulminating, the proper nervous details
were perfectly normal, but there was
found congestion of the membranes
of the cord and two blood extravasations of considerable extent on the outer surface of the dura mater in the cervical region. This condition can not, of course, be made answerable for the death of the patient, and must be considered rather as a concomitant of the morbid process which also caused the death. In the two other cases, both of a chronic nature, softening of the lumbar portion of the cord was found, and in one of them it is noted that the membranes were congested, the capillaries of the softened portion of the cord were distended, and there were many small extravasations. Here too we have not enough to account for death, and the softening may be looked upon as the result of prolonged impairment of function. Both the course of the symptoms and the morbid anatomy point to the lumbar portion of the cord as the part first affected. The change in the nutrition of its nervous elements tends to spread upward to the higher portion of the cord, as shown by the symptoms in the upper extremities, and to implicate the nervous centres of the heart region as shown by the cardiac symptoms, to implicate also the vasomotor centres as shown by the arterial palpitations, and the dyspnea.
This change in the nutrition of the nervous centres is of so subtle a nature as to cause no visible alteration of structure in acute cases, and is of a kind which frequently permits of entire restoration, although a tendency to recurrence of the morbid condition remains.

The absence of a febrile condition excludes the idea of an inflammatory change. Sudden occurs apparently by implication in the morbid process of the nervous centres of the heart and respiration, or by the mechanical impediment to these functions by serous effusions in lungs and pleura.

The derangement of the heart is in the first instance functional. Whether it arises from stimulation of the sympathetic nerve (accelerator) of the heart, or diminished energy of the vagus, or implication of the nervous ganglia of the heart itself, our present knowledge does not enable us to say. But lesions are found in the heart itself, which are apparently secondary to that of the nervous centre, impaired nutrition of it, muscular substance and dilatation of the right ventricle through imperfect contraction and impediment in the pulmonary circulation. Valvar lesions are not found.
Similarly the degeneration or atrophy of the
peripheral or paralysed muscles of the extremi-
ties is due to impingement of their trophic
centers, or the result of disease, probably both.
The edema of Kallko seems to me to be one of its most interesting and sug-
gestive phenomena. It is generally in
the first instance localized and segment-
ary, and in the same area as the
nervous phenomena, and therefore sug-
gest the idea that it too is of nervous
origin. It may occur before the heart
action shows any change, where there
is no anaemia, nor renal complica-
tion. It does not follow the mechanical
principle of gravitation, being often over
the tibiae or about the ankles, not in the
feet. A parallel to it may be found
in the edema which follows injury of
a nerve. Mitchell in his work on the
injuries of the nerves, says: "Nutritive
changes in the connective tissue are
common after nerve wounds, and
are first seen in the shape of edema
local or general in the limb affected."
A centripetal change may therefore well pro-
duce a similar condition.
The general anaemia and the serous
effusions which occur in grave cases of
long standing are an exaggeration of the local
sedema and to be accounted for on the
same principle, but doubtless furthered by
an anaemic condition and the embar-
rassment of the heart's action. We cannot,
however, be considered to have solved
all the problems of the case, even when
we have demonstrated the existence
of hydrenemia. Meurice's view of the
pathology of the disease is that it is essen-
tially an alteration of the blood, analogous
to cachectic dropy, pernicious anemia,
and chlorosis. "The blood serum," he
adds "loses the faculty of remaining in
the circulatory organs and cools through
the tissues or gathers in enormous quan-
tities in places where most soon is to be
found." Apart from the fact that it
has been shown that anaemia is not
an essential factor in the disease, this
is our inadequate explanation of the dropy.
Experiments made by Ohlmeyer and
Lichtheim to determine the nature of
hydrenemia sedema by injecting solutions
into the circulation of lower animals,
show that alteration of the blood by
itself is insufficient to produce it. In
all the cases, even when the largest
injections were used, up to 92 per cent.
of the weight of the animals, there was no evidence of cutaneous oedema, the subcutaneous connective tissue being invariably perfectly dry. The most striking result were chemical effusions into the abdominal cavity and oedematous swelling of the pancreas and gastro-intestinal walls. The pericardial and pleuritic sacs contained no fluid, nor was there any oedema of the lungs, except in the few instances where death resulted from this accident. The central nervous system and subcutaneous connective tissue were also invariably free from oedema. They conclude that in oedema two factors must cooperate, hydrenemia or hydrenemic plethora and a most rigid condition of the walls of the vessels, and consider it probable that a long continued hydrenemia itself brings about this condition of the vessels. (quoted from Virchow's Archiv, 1879 in Schregen's cyclopaedia) I would add that it is also probable that this condition may be brought about by the direct action of the facial motor nerves. Their experiments endorse the views of Baycock advanced upon clinical grounds many years ago in his Clinical Inquiries into the influence of the Nervous System and of
Spastic tissue changes on the production and treatment of dropsy. He maintains that there are micro vascular areas in anasarca, that the distribution of anasarca is not always governed by gravity, that facts do not sustain the 'bottle-filling theory', that there is a prior condition required for the effusion, which seems to be either a condition of the living tissues, or of their capillaries. He argues that in cardiac and renal dropsy it advances pari passu with pulmonary and cardiac congestion, but then, the latter existing to the same degree, results are in some cases extreme dilatation of the right heart, haemoptysis, oedema by pulmonary apoplexy with little or no anasarca. What makes the difference? Is it hydramenin? But this is often not very manifest in cardiac general dropsy, and in some cases dilatation of the heart and pulmonary congestion are consecutive to the anasarca. But then, it is said, the vessels were just weakened by anaemia, so as to allow transudation of serum, thus becoming an impediment to the circulation and requiring greater cardiac effort, hence dilatation. These are cases which being general affect both sides alike. Where
sclerosis is unilateral there must be therefore an additional element. He gives cases in support of his argument and concludes among other points that the nervous system taken as a whole, or else some special division of it, has a direct influence both on the production and prevention of anaesthesia; that anaesthesia is produced when innervation is defective; and that production or prevention alike follow upon changes in innervation which are induced in the same way and according to the same laws as other nerves.

Mr. Buxton, in an article in the Practitioner (Vol. 11, 1878) quotes the experiments of Reunier and of Goltz on the dog in which the lower vena cava, having been previously tied, dilatation of the vessels and sclerosis followed on that side section of the sacral or section of the sympathetic fibres passing to the sacral plexus, while only motor paralysis followed division of the motor strands as they issued from the lumbar vertebrae before they were joined by the sympathetic fibres, thus showing conclusively that dilatation of the vessels by paralysis of the vaso-motor nerves is one factor in the production of sclerosis.
Following out this line of thought it is not difficult to construct a theory of the modes of action of the vaso-motor nerves in the production of dyspnea. Inasmuch as dyspnea is an exaggeration of a normal process of transudation of fluids from the blood-vessels to the tissues around them, which process is under the regulation of the vaso-motor nerves, we have a priori reason to consider that derangement of their regulating power may cause dyspnea. The opposite process of shrinking of the tissues and deficiency of fluid in them, as in the cold stage of ague is due to the constriction of the vessels of the surface under the deranging influence of the ague-poison upon the vaso-motor centres; and this affords a presumption by analogy that oedema may result from the dilatation of vessels under paralysis of vaso-constrictor, or stimulation of vaso-dilator nerves.

It appears that mere obstruction to the return of blood by ligature of a vein may not be sufficient by itself to cause oedema, also that division of vaso-motor nerves by itself does not lead to oedema, but that both these interferences together do. It also appears that injury of a whole
nerve including sensory, motor and vasomotor fibres frequently leads to oedema. Hence we are led to the conclusion that the altered nutrition of a part which is brought about by division of it, motor and sensory nerve-supply, may have the same effect, so far as oedema is concerned, as obstruction to the return of blood. A diminished power in the tissues of appropriating the nutrient material of the blood, coexisting with increased blood-supply by arrangement of vaso-motor nerves, may be the cause of stagnation of the nutrient fluid around them, or a disturbance of the equilibrium between the intra-vascular and extra-vascular fluids which constitute oedema. A central lesion involving sensory, motor and vaso-motor centres may therefore be supposed competent to produce oedema.

The problem of the causation of drying is much more complex than the mechanical theories usually advanced suppose. Any theory which ignores the vaso-motor system of nerves is inadequate. The considerations which I have advanced tend to show that the part played by the vaso-motor nerves in the produc-
tion of droopy is not inconsistent with physiological principles, and afford an explanation of the palsy of Rakke which the ordinary views of the causation of droopy fail to do. The palpitation of the ateries and the pulse of low tension observed in Rakke afford additional clinical evidence of a derangement of the vas motor centre, in Rakke.

With a view to the Aetiology of the disease we must consider the fact connected with climate, season, locality, age and sex, race, habits, hygienic conditions of the people generally.

Climate. The empire of Japan lies between latitude 31° N. to 45° 50° N., its capital, Tokio, being under the same latitude as Malta. One might expect therefore that its climate would be similar to that of the south of Europe. As a matter of fact it is both colder in winter and warmer than in summer. One cannot speak, however, of the climate of Japan because there exists a considerable difference between the extreme north and the extreme south of the empire. The island of Yesso in the northern portion is colder in winter than the north of Scotland, and the southernmost portions of Japan have a
winter much milder than that of the south of England, while the summer is much hotter. The place of my residence was the treaty-post of Negot on the West Coast, lying under latitude 37°33'. Its mean annual temperature is 13.1°C. The west coast generally is colder than the opposite side of the island being more exposed to the N. & N.W. winds from the continent of America. The winter in Negot is long and severe with considerable fall of rain and snow and prevalence of strong, cold, north winds. Snow covers the ground in the flat country round to a depth of not uncommonly, two feet, and in the higher-lying district, to a much greater depth. Dr. Klein, in his recent work on Japan, remarks: "If we compare with the temperature of Negot those of several places in the same latitude, we find that the yearly mean for San Francisco is 13.5°C., for Athens 17.7°C., and for Palermo, 19.5°C., or about 0.4°C., 4.6°C., and 6.6°C., higher respectively. In Negot, January and August are the coldest and warmest months respectively, have mean temperature, 10.9°C. & 26.4°C. In San Francisco on the other hand, January has a temperature of 9.6°C. and September on the other hand
as the warmest month only 16.2°C. Thus in
the latter case, there prevails a marked
sea climate, and in the former case an al-
most continental climate.

A notable feature of the climate throughout
the country is the predominance of warm
moist south winds in summer and north
northeasterly and north-westerly winds in winter.
The strength of the direct rays of the sun
together with the cold winds in spring are
a cause of a prevalence of want of ef-
faction at such times.

Another important feature of the climate
is the prevailing moisture. Dr. Reim says
that on the average the relative moisture
amount to 52% for the warm season,
71% for the cold season and 76% for the
year. With regard to the rainfall—There are
but few districts in the world which
compare with Japan as regards the quan-
tity and distribution of the yearly
rainfall. This would chiefly be the case
with the Gulf States of North America, where
likewise the summer is the rainiest
season of the year, and the quantity
of rain equals that in Japan.

Hence, as might be expected, Japan
possesses almost all the diseases of tem-
perate climate, and some of those which
we generally find in tropical climates. The excessive moisture in connection with the great summer heat is favourable to the production of malarial poisons. Hence a prevalence of malarial diseases. It must also be remembered in the same connection that Japan is one of the most mountainous countries in the world. Its rivers are rapid and of short course, carry down with them a great deal of alluvial deposit, and are liable to swell and to subside again rapidly. Another fact to be borne in mind is that rice is the chief crop. Every available spot high up in the valleys, and on the mountain-slopes is terraced into paddy-fields, and every plain over which water can be led is under cultivation for rice. Hence the sub-soil is perpetually saturated, and in dry seasons and towards the end of summer these areas as well as the shallow margins of the rivers are apt to become partially dry mud-beds, which are a fruitful source of malarial emanations. The combined heat and moisture lead to a diminution of vascular tone and depression of nervous energy.

Season. The season of prevalence of hakke is that of increased heat and moisture.
In many summers it is especially frequent and severe. In the winter months, only the chronic form is met with, or what may be considered sequelae of the disease. According to Anderson's observations in Tokio, the early cases occur at the beginning of June, or in the latter half of May; in July the number is largely increased; the maximum is reached in August, and a sensible decline is noticed towards the end of September. From December to March an outbreak is rare. Dr. Simmons remarks that Kakki patients bear very ill any sudden change in the temperature.

Of 52 cases of Kakki occurring in my dispensary practice in Kiakata in twelve months, the following is an analysis due to time and character.

<table>
<thead>
<tr>
<th>Month</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 3 (chronic)</td>
<td>July 7 (chronic, subacute)</td>
</tr>
<tr>
<td>Feb. 1 to Aug. 14 (chronic)</td>
<td></td>
</tr>
<tr>
<td>March 2 to Sept. 3 (chronic)</td>
<td></td>
</tr>
<tr>
<td>April 9 (chronic, subacute)</td>
<td>May 2 (chronic)</td>
</tr>
<tr>
<td>Nov. 2 (chronic)</td>
<td></td>
</tr>
<tr>
<td>Dec. 2 (chronic)</td>
<td></td>
</tr>
</tbody>
</table>

The division into chronic and subacute is one however which does not admit of any very sharp distinction, and in some cases I have been doubtful which to call it.
Locality. Upon the point more exact information is desirable. The disease appears to be endemic in the larger centers of population, the chief city of Japan. These are frequently built upon alluvial soil at the mouth of the larger rivers, and are imperfectly drained. But the disease is not confined to these localities. Hakodate is situated on the slope of a hill by the sea-side, and the disease is well known there. Niigata is built upon a strip of alluvial soil between the mouth of a river and the sea, partly sandy, partly swampy. A rise of the river or heavy rains causes the town to be partly flooded. The disease though well known, rarely occurs in its severest forms. All writers on the disease in Japan, however, incline to a belief that a low-lying ill-drained soil is an important factor in the production of the disease. Eldridge says "In certain districts, generally but not invariably lying low and near the sea-coast, the disease is rarely absent, while within these districts there appears to be free at which the cause of the malady manifest itself with greatest intensity. In other perhaps closely neighbouring localities"
generally inland and of higher level, it never generates the more. Simmonds also states that the disease is limited to well-defined localities, and not often observed to spread beyond them except from well-understood causes. He justifies this statement by reference to the topography of Yokohama and the prevalence of kabake in certain localities, there and not in others. The disease prevailed in the swampland level on which the town was built, and in certain institutions, in which the sanitary arrangements were good, but which were built on the slope of the adjoining bluff, facing the swamp. In certain other institutions, with inferior sanitary arrangements, but built on the opposite side of the same bluff, the disease did not occur. This difference he attributed to the fact that the south-westerly winds of summer carried the poison of the disease from the swamp where it originated to the hill-side exposed to them, while the other side of the hill was sheltered from these winds. This is a plausible theory, but a wider observation effect is necessary. From what I have heard of the prevalence of the disease in various parts of the
country, it has seemed to me very doubtful whether the areas of its prevalence are at all sharply defined. On the other hand the Japanese are very much given to travel. Hence, if there is reason to suppose, the disease may remain latent for a considerable period, the possibility must be borne in mind of its having been contracted during a temporary residence in a place, and not manifesting itself till long after.

Age.—The disease does not attack the very young nor the aged, chiefly those in middle age. Of 52 patients of mine the distribution as concerns age was from 15-20, 13; from 20-30, 18; from 30-40, 15; from 40-50, 5; from 50-60, 1.

In a report of the Kakhi Hospital quoted by Simoons out of 85 patients 1 was under 15; 14 were pr. 15-20; 50 were pr. 20-30; 11 were pr. 30-40; 9 were pr. 40-60.

Sex.—Women rarely suffer except in the puerperal state. Of 52 cases of which the particulars were noted by me, only one occurred in a woman.

Race.—No cases of Kakhi have been known to occur among foreigners.
resident in Japan.

Habit and Hygienic Conditions.—No connection

can be established between any article of diet

and yakkei. The staple food of the people is

rice and fish. They have of late years begun
to consume beef, and milk. There is no

lack of fresh vegetables. Bean-curd prepared

in a digestible form is a favourite and

delicious article of diet. On the whole the

people are fairly well fed. Yakkei occurs

as much or even more among the well-

nourished, than the under-fed.

The homes and social life of the people

reveal several unsanitary conditions, and

we may fairly reckon among predisposing

causes whatever lowers the general health

and reduces the power of vital resistance

to the morbid agency whatever it may be.

Among these bad ventilation is prominent.

Their method of heating is by charcoal fires

without any escape for the fumes. The

same rooms are used as sitting and bed-

rooms. At night outer shutters are closed,

while a large number of people lie huddled
together on the mats on the floor. Whatever

fresh air enters is by unintentional leakage.

The common use of paper instead of glass,

which being unsoiled permits an inter-

change of gases considerably mitigates th
injurious effect of their indifference to ventilation. Their privies are often so situated that the effluvia pass into the dwelling. They have no sewerage, but the contents of the privies remain in open wooden vats, and are emptied only when full to be thrown over the fields, so that the proximity of open spaces is often the reverse of being the means of securing pure air. A national institution is the hot-bath, which is indulged in not merely for the sake of cleanliness, but as a luxury and as a method of warming the body in winter. It is resorted to by all classes as frequently as once in two or three days all the year round, and a temperature of 105°F. is for them a moderate heat. Probably less harm follows than we might expect because it acts as a cathartic, the effect lasting for a little while, but it is impossible not to believe that it has a debilitating effect.

There is a lack of out-door exercises and mainly sport, among the young men. Too early marriage and sexual incontinence are also a cause of defective development. Prostitution is a recognised institution and seplulchre of life. Intoxication with a fermented liquor brewed from
rice, and of recent years with imported
European alcoholic drinks, or vile invita-
tions of them is a not un-common vice.
The same effect, of chronic tippling and
observed in Japan as in Europe.
These and other unsanitary arrangements
in the ordinary life of the Japanese tend to
keep them at a low degree of physical
vigour, so that they more easily succumb
to a mortal poison, but no direct relation
can be traced between any of them and
Rakke!
It has seemed to me, however, that the
habits of the Japanese in sitting and
walking were a probable cause of de-
fective innervation of the legs. Their
custom is to sit upon their matted floors
with the legs bent under them, the back
of the thigh in contact with the calf
of the leg, the foot extended and turned
inwards, so that the shin over the outer
malleolus (which becomes horny in every
Japanese in consequence) is in contact
with the floor, and the whole weight
of the body compresses the leg on the
floor. In this position meals are
eaten, business is transacted, friends
sit in company, the clerk or the student
sit at the desk, and an audience sits,
to hear a public speaker. To sit in any other position is impolite, and is never done without permission asked or at the express request of your host. One of the most marked features of the Japanese character is their punctilious politeness and rigorous regard for etiquette, which would lead them to endure considerable discomfort without betraying it rather than violate propriety. The foreigner cannot endure the position for more than a few minutes, but the Japanese, trained by long use, can maintain it for several hours. Still it is unusual to sit with them after a protracted sitting to experience numbness, stiffness, pain and difficulty of extending the legs. Mr. Faulds of Tokyo mentioned to me a case of paralysis of the legs in a heavy man who had sat for three consecutive days in the position absorbed in watching wrestling matches. Wrestling is the athletic sport of Japan which excites the keenest interest, and occasionally a competition takes place between the champion wrestlers which is continued for several days. He was unable to walk or stand but recovered the use of his limbs under appropriate treatment.
I once saw in consultation a prisoner who suffered in the same way in consequence of prolonged confinement in the position, who also recovered under police motion, paralyzation, atrocity and the gradual use of the limbs. A similar case was that of Pierre Loirotti, a Roman priest, who, after the proscription of the Christian religion in Japan, was landed there in the year 1708. An old Japanese manuscript giving an account of him has recently been translated. He was imprisoned and carried about in a small case from which he was not allowed to escape for some time. Being carried from Nagasaki to Yedo, a journey of over 300 miles, in it, the cramping of his body in a squatting position had deprived him of the power to walk which he never afterwards regained.

The Japanese custom of wearing clogs raised two or three inches above the ground and held only by the thong, passing between the great and the next, appears here to act injuriously also. The effect is that in walking the heel is never firmly planted on the ground, and their walk becomes a shuffle in which the knees are never braced.
their method of both sitting and walking acts as a predisposing and possibly also as an exciting cause of defective innervation of the lower extremities. Such a posture involves continued pressure upon the nerves and interference with the circulation. That it may be an exciting cause is rendered probable by the fact that those who live a sedentary life are particularly liable to the disease,—students, apprentices, and such like. In former times, those whom etiquette compelled to squat in the presence of the feudal princes for considerable intervals were said to be very frequently the victims of hæmorrhoids. Agricultural labourers and open air workers are rarely attacked. That women are frequently attacked during their confinement is not surprising when we learn what their method of treating the puerperal state is. The hæmorrhoids are bound tightly for 30 days, sometimes so severely as to cause ulceration. For a period of three weeks the woman is kept in the squatting position above described, day and night, supported by bedding around her, while she is kept on a diet of rice, salted and dried unripe plums; unless there exhaustion compels them to mitigate the rigours of the practice.
Among exciting causes of Rakkei, exhaustion from over-work and exposure to wet and cold appears to take a prominent place. Unusually prolonged standing and walking, working with the feet and legs in the water, as in fishing and the handling of timber, appear frequently to determine an attack of Rakkei. Policemen who are put into leather boots and made to stand and lounge about for unreasonably long hours while their feet are wet are particularly liable to be attacked.

According to Anderson overcrowding and bad ventilation is a powerful exciting cause. He remarks: "The defective sleeping accommodation on ships appears to be especially active in determining an outbreak of the disease in those who have previously lived in a Rakkei district. A striking example of this occurred in the summer of 1875 amongst the crew of a Japanese vessel lying at anchor at Yokosuka, but of 300 seamen, about 70 (the exact number could not be ascertained) were attacked by Rakkei, over 20 died in a very short time, and 47 were afterwards sent for treatment to the Naval Hospital. Fifty other men were at the same time prostrated by various diseases. Inquiry
showed that the food, clothing and exercise of the sailors were satisfactory, but that nearly the whole crew slept during the night in a space allowing only 32 cubic feet per head, while owing to the place of anchorage of the ship the air received was almost stagnant. After a medical examination the sleeping arrangement was at once altered by the Admiralty and as a result the epidemic almost immediately ceased.

A prevalence of hot and damp, close steamy weather appears also to be favourable to the outbreak of Kaffir. This is specially insisted upon by Dr. Wernich in comparing the epidemics of 1875 and 1876. The former year was characterized by a prevalence of such weather and of the disease, the latter was an exceptionally dry and warm summer, until September when a prevalence of depressing moisture was accompanied by an outbreak of the disease which had occurred only quite sporadically up to that time. It is also a matter of common observation.

Having thus enumerated the facts which have any bearing upon the aetiology of Kaffir, it remains to consider whether we can frame any theory of its
pathogenesis. It is easy to cut the knot by supposing a specific poison, allied to malaria, of unknown nature and origin, which is the cause of all the symptoms. But before resorting to this hypothesis it is necessary to exclude other possible and more simple explanations of the facts.

Dr. Handfield Jones in his Lumbelian lectures in 1863, on some points in the Pathology of Nervous Diseases, seeks to establish the existence of a primary functional form of paralysis, that is, not dependent on any invasion, extravasation or other evident organic alteration. After mentioning as a normal analogy, sleep, which is such a temporary paralysis from exhaustion, he adduces some kinds of infantile paralysis, with no sign of central organic disease, chiefly characterized by debility, evanescent and curable by tonics; also cases due to exhaustion, as paraplegia from excessive efforts, leaving no p.m. trace of organic lesion, macroscopic or microscopic (Eulh); to exhaustion from excessive exertion, especially when added to sexual excesses; cases of paralysis from alcoholic abuse, from debility attending epidemic catarrh; other
Observe cases of paralysis without organic lesion; diphtheritic paralysis; cases of overexertion or injury followed after a while by disintegration of the tissue of the cord without emoliation in it or its membranes; cases of temporary paralysis of the ciliary muscle of the eye as a result of various debilitating disorders; nervous debility caused by heat, heat-apoplexy and its after effect, dravins; indication of nervous exanglement from enfeebled climatic influences without organic lesion; night-blindness as a functional paralysis often due to various debilitating causes, irreparable by better nutrition and tonics. He also quotes material cases which I should consider due rather to the direct action of infection. He considered highly probable that vital exhaustion and functional incapacity may, if extreme, pass into actual decay of structure, into a state of irreparable organic lesion. He concludes: "The general conclusions which the above review inclines me to adopt are that primary failure of ganglion cells in the nervi cnicere, encephalic, spinal, or sympathetic is a condition of rather frequent occurrence; that it is commonly the result of un-
feeling and prostrating influences, acting for a longer or shorter time, that its phe-
omena may set in suddenly, that they are not dependent on general or local
anaemia or on reflex irritation, that it is attended with visible structural
changes in the early periods of its existence; but that, if prolonged con-
siderably, it may become complicated with atrophic degeneration, and that
the remedies suited to it are all such as can excite and maintain nervous
power. If so, functional nervous pain deserves to be most distinctly recog-
nized in our nosology and not merely tacitly admitted as a matter of proba-
ility.

In accordance with these conclusions it seems to me a sufficient explanation
of the symptoms of rickets, without involving malaria, to regard it as a
primary functional paralytic of the sensory, motor, viscero-motor centres of
the cord, caused by a combination of depressing influences, which may vary
in different cases, but which have been already enumerated. Prominent amongst
these I would place climatic influences, and the depressing effect of sexual in-

Japanese indulgences, and of their method of sitting. These two latter probably render the lumbar portion of the cord peculiarly vulnerable and determine the stress of the disease on the lower extremities. (It may also afford an explanation why young men should be peculiarly liable to the disease, as remarkable however that men are more liable than women to paraplegic affection. Of 171 cases of paraplegia observed by Brown-Segard, 125 occurred in men, 46 in women.) The acute and fatal cases are probably due to a similar affection of the centres in the medulla oblongata. The Japanese suffer from a variety of ill-defined nervous complaints which may be grouped as neurasthenia. Their nervous system is that of a developed and civilized race. The diseases supposed to be peculiar to modern life are as common amongst them as amongst Europeans.

Dr. Wernicke lays stress upon a peculiarity of the Japanese constitution which he calls an unstable equilibrium of the circulation. He considers that deficiency of nourishment containing fat and albumen, the influence of a moist warm climate, and the wide, open coast
give a foundation for the disposition in every individual born of Japanese blood. However, the may be there certainly exist in them an unusual excitability of the vasomotor nerves. An indication of it, which every foreigner must have observed, is the remarkable effect of small quantities of alcohol upon them. Without other symptoms of intoxication, a single glass of wine or a few ounces of their favorite liquors at once a crimson flush of the whole face and prominence of the veins which last, for a little time and betrays their冲. This sensitiveness of the vasomotor system, doubtless predisposes them to functional derangements of it. Foreigners resident in Japan also frequently fail in health from various forms of neurasthenia, and it is remarkable of this class of cases, as of Kaketsu, that the general appearance is that of good nutrition and fair general health, which is deceptive as to the reality and importance of the disease.

I may perhaps be thought to have laid too much stress upon the injurious manners of sitting of the Japanese. Abundant clinical facts, however, an impairment of
suppression of function of nervous centres may be caused by a peripheral impression. Painting under pain, death from shock during or after surgical interference are notable instances. It is in harmony with many clinical observations to suppose that as the sudden and severe impression causes an instantaneous and dangerous or even fatal 'reflex paralysis', so prolonged and repeated pressure upon a nerve may cause a paresis of the nervous centres, or a condition under which they fail on slight additional provocation. Reflex paralysis appears to be looked upon with disfavour and suspicion. Setting aside however Brown-Seguar's theory of spastic ischaemia of the cord as too fanciful, and allowing that many cases may be referred to an ascending micting implicating portions of the cord, there remain a large number of well authenticated, however inexplicable, cases in which a paresis or paralysis of remote nervous centres is caused by peripheral impressions. It has also been proved that strong irritation of distal parts (cutaneous nerve) may exert an inhibitory action on tendon-reflexes. (Wolffnagel and Lewinski, Arch.f.Psych.vi. 1876. Bid.vii. 1877 referred to by Lewinski)
Inconclusive as these hypothetical considerations must be, they seem to me preferable to the hypothesis of a malarial poison. Japam undoubtedly presents favourable conditions for the development of microscopical organisms. That malarial influences are capable of producing functional paralysis there is fact to show. Intermittent paraplegia due to malaria, comparable to quinine is also described. Kakke is entirely different, however, from malarial diseases proper, in that it presents no fever and no periodicity, and that quinine has no decided effect upon the disease. Hence those who have considered it malarial, have used that word in the wider sense of some unknown but specific microscopical influence, analogous to aqua-poison, but differing from it. The argument, for it is from the distribution of the disease. In this point however further investigation is desirable. Certainly the acute forms of the disease are suggestive of the action of a definite poison upon the nerves. These however are the exception, rather than the typical and common cases. It appears in favour of the malarial hypothesis that change of air.
is frequently the most efficacious treatment. The mysterious latency of the disease, and the tendency to recur under slight provocation are further points of similarity to malarial disease. It is obvious that until we know more definitely when and how the supposed poison enters the system, we cannot speak with certainty of its period of incubation or latency. Dr. Anderson narrates an epidemic upon a training-ship, from which it would appear that the poison, if it exists, may remain latent in the system for six months. "In the beginning of November, 1875, a training ship, the Tsubuta-Kaui, left Yokohama for San Francisco with a crew of 230 men, 70 officers and cadets, and 3 English instructors and returned on the 14th. April, 1876. Throughout the voyage cases of Kakki appeared at the rate of about two or three in a week, although the ship was distant from any possible source of infection, and was itself kept in a perfect state of cleanliness, and despite the more remarkable fact that the period of the year was precisely that in which Kakki is most rare in Yedo. One fatal instance happened just before the arrival of the ship in Yokohama, upwards of
six months after the patient had left Japan. The total number of cases was about sixty, all of which occurred amongst the crew; the officers and cadets who were better lodged and fed, being quite exempt. The determining cause appeared to be the overcrowding that must always exist in a fully-manned ship, and this was probably assisted by exposure to bad weather, to which the recently recruited crew had not become inured, and possibly by a diet which, though unobjectionable under ordinary circumstances, was not sufficiently nutritious to maintain the amount of vigour requisite to resist the depressing conditions of sea-life.

The above history tells more of a combination of unnatural conditions than of a latent poison and rather suggests that the matrices morbi may remain undeveloped for indefinite periods in those who are well cared for.

It must be admitted however that there is on the whole a preponderance in favour of a specific poison.

There is nothing in the history of Hakke to indicate that it may be spread by infection from one person to another, nor have I ever heard of this being even suspected by anyone, native or foreign, lay or professional.
Thus far I have confined my attention to the phenomena of Kali
ti, as the disease occurs in Japan, without reference to Beriberi, and
have done so because it seemed to me to conduce
most to lucidity to obtain a picture of the dis-
case in Japan, and the conclusions which
may be formed upon it. It has been gener-
ally assumed that the diseases are identical
or nearly allied. The views of medical au-
thorities in India, however, have been so
much at variance on the nature of Beriberi
that it is no easy matter to sift and weigh
their statements and opinions. The difficulty
is increased by the latest authority on the
subject, Dr. Chevers, who in a paper read
before the Medical Society of London on March
31st. of this year on Beriberi, which he
designates *Pellis Exanthematica Orientalis
or Beriberi Fever,* propounds the doctrine
that "acute beriberi is an exanthematicos
fever, hitherto best known by its sequelae,
acute general anaemia, and frequently
but not invariably *Morbus Brighti* and
paraplegia." If this opinion is to be ac-
cepted, there is an end of difficulties, be-
cause in that case it is evident to anyone
who has studied the disease in Japan,
that Kali
ti cannot be brought under Dr.
Chevers's definition of Beriberi, and the disease,
must be distinct. There is no exanthem in
the Japanese disease; fever is generally absent
or if present is trivial and not in proportion to
or due to the symptoms of Kakké. What Dr.
Cheever describes are the sequelae are in Japan
the early manifestation of the disease. Dr.
Cheever has concluded that an epidemic
which prevailed in Bengal and the Mauri-
cities in 1877 and 1878 was typical acute
Beriberi. In order to believe this, we
must suppose that other observers have
been very inobservant, and that they
have as Dr. Cheever says of Malcolmson
"commenced their description of the symptoms
at the beginning of the end", or else that
the disease has undergone a change of
type, and only assumed its true charac-
ter for the first time in the recent epi-
demic. Finally we have the alternative
of supposing that Beriberi is not one
but a group of diseases.

Another source of confusion in studying
the disease in India is that we have the
two terms Beriberi and Barbiers, which
are treated by some as the same disease
by others as distinct. Barbiers appears
to be the form of the disease characterized
by more or less paralytic symptoms
without droopy, and Beriberi the perfected
to that in which oedema forms the most prominent symptom. Materials are want- 
ing for a careful comparison of Barbier's with Rabl's.

In Johnson and Martin's work on the in- 
fluence of Tropical Climate on European 
Constitution, 1841, is an account of Reichen- 
by three separate observers, Christie, Hamil- 
ton and Ridley. Comparing the disease 
in Japan with the account of Christie, we 
cannot doubt the identity of the disease in 
the two countries. He recognizes the same 
varieties in the degree of oedema and the 
chronicity or severity acute character of the 
disease in some cases. His account of the 
post-mortem appearances agrees with those 
of the disease in Japan. We note that he 
has never seen the disease in a woman, 
and that the sedentary and civilized 
are most liable to the disease. Points of 
difference are that at a late stage of fatal 
cases "some fever with delirium often 
accede and terminate the life of the un- 
fortunate sufferer," also that the aged 
are liable to be attacked. In Japan,

*Note Scott in the Cyclopaedia of Practical Medicine, and 
Rochard in the Nouveau Dict. de Me'd et de Chir. 
regard Reichenb. & Barbier as two distinct diseases.
The aged are exempt and head symptoms do not occur.

Hamilton and Ridley's descriptions corroborate generally that of Christie. Hamilton found evident marks of congestion of the spinal cord, particularly in the dorsal region and was convinced that it arose in a great measure from obstructed circulation in consequence of congestion in the internal parts, more especially the liver and lungs, and that Rei-bei consequently could not be merely a disease of debility as supposed by Colquhoun, Hunter, Christie, and others. "Prevalence of the disease during change of monsoons may be accounted for by the damp, loaded state of the atmosphere and the extreme vicissitude of deep temperature, which by suddenly checking perspiration and producing unparalleled atony of the extreme vessels debilitated by previous excess of action, break at once with violence, the balance of the circulation." These remarks are interesting as bearing out the importance of atmospheric influences, and the fact of visceral congestion and disturbed balance of circulation which have attributed to rearrangement of the vasomotor center.

The accounts of older writers are
summarized in an article by Scott in Reichen's *Cyclopaedia of Practical Medicine*, London, 1833. Dr. Rogers who had studied the disease in Ceylon, made it the subject of a thesis presented to the University of Edinburgh in 1806 under the title *Hydropia hystericomotoria*. Cases in which the cardiac disturbance with dyspnea and dysphonia were prominent over the special symptoms appear to have been especially studied by him. Scott objected to a name which ignored the paralytic affection of the lower extremities, which he considered the most constant symptom. Scott's general description identifies it with what has been described as the dyspeptic form of the disease in Japan. He adds that in 1815 in Ceylon in some cases which came under his notice the rectal or auricular symptoms were apparently unimportant, although death was the result. Some of the patient expired who appeared to be recovering and who stated shortly before death that they were better. The dyspeptic symptoms did not by any means appear to be the immediate cause of death and Dr. Chauette states that some of his patients died who had no decided auricular symptoms; the face was however bloated.
It prevailed in Ceylon from 1795-1803, and its ravages were such among both European and native troops that it earned the title of "The bad sickness of Ceylon."

Observations as to its etiology in Ceylon are discrepant. Christie, Rogers and others in Ceylon considered it a disease of debility from bad air and food and exposure to a moist and marshy atmosphere while debilitated by residence in an unhealthy station. On the other hand, Scott remarks that in 1815 in Kandy troops and followers exposed to variable weather, privation in regard to food, and other causes of physical and mental exhaustion, but beriberi did not supervene (Marshall); while in Trincomalee those who adopted every precaution as to food and clothing were mortified to find the disease not checked by their prophylactic measures. In Trincomalee 200 Europeans died of it in the year 1795. It is noted that those of sedentary occupation were especially attacked, while officers, women and children were generally exempt.

Scott is inclined to consider the deficiency affection as the result of inflammation; in what way, he does not say.
In diagnosis he puts paralytic symptoms first and the "with dyspoeas and purpural effusion appear sufficient to distinguish it from other disease."

I have not been able to obtain access to Malesherbou's monograph on Kleber. His experience of the disease led him to entertain the opinion that the chief part of the disease was in the spinal cord and its membranes; and he describes serous effusion and congestion of the cord and in one case an effusion of reddish coagulable lymph on the posterior surface of the theca at the 4th, dorsal vertebra and the same in the region of the sacrum.

His testimony is interesting; to observers of the disease in Japan as to the reality of the symptoms referable to the spinal cord, because some describers of the disease in India appear doubtful whether the symptoms were merely stiffness and heaviness of the limbs for paresis. On the other hand the organic lesions of the cord are not uniform and in some cases entirely wanting, so that they cannot be considered as the basis of the disease any more than the congestions and serous effusions in other visera, but rather as results of the disturbance of circulation which is one of the symptoms of the
disease. It is important to remark that the spinal symptoms are hardly referable to a serum effusion on the cord, because they are often the first symptoms of the disease, both in India, as Malcolmson has pointed out, and in Japan, whereas the effusions take place in the late stages of the disease. It is therefore not in harmony with the facts to regard these spinal symptoms as sequelae:

The view of Rambert that Beriberi depends mainly on a form of Morbus Brightii has not been supported by anyone else. That congestion of the kidney, as of other viscera, occurs is abundantly shown by autopsies, and Bright's disease may accidentally coexist, but has not been shown to have any essential relation to the disease.

Morehead's description of the disease (Researches on Disease in India) corresponds with that of others in the main. His pathology is as follows:—"Beriberi is in my opinion a general dropy of complicated character. A state of the system in which the blood is deficient in quantity and its water in undue proportion is the predisposing condition; and cold or wet is the exciting cause; no doubt in some instances, the effusion is further favoured by existing
lung, heart, or kidney disease." The disease more particularly in its acute form will be found to present itself in individuals favourably circumstanced for the development of a seborrhoeic taint, and who, while in the diathesis, have been exposed to the sudden cooling of the surface of the body from sudden alternations of temperature or of wet. His conclusions appear to be based upon personal observation in only four cases. No mention is made of symptoms referable to the cord; failure of motor power is mentioned in two of the cases as a waddling gait from stiffness and swelling of the thighs and groins. Two of them were fatal and autopsies were obtained, but nothing more striking discovered than slight effusion in the cavities, fluid blood in the heart, congestion of the viscera; spinal cord not mentioned; blood normal under microscopie. He remarks on these: "It is true that the external phenomena of fever were not present: in two the gums were discoloured, but not swollen and spongy. But in order to explain the disease, the actual presence of seborrhoeic phenomena is not necessary. He argues that the diathesis required time for its development, addsuce the fluid condition of the blood, the feeble action of the heart.
not due to mechanical causes, its dilated ventricles, & failure of its muscular fibre, with death from apoplexy, in support of his view. He seems to have been lead to the view by the occurrence of an epidemic among a crew of lascars from Bombay. Out of 65 men 35 were attacked and 10 died. The officers and passengers who used anti-ascorbites and whose general hygienic conditions were better were not attacked. It commenced after 2 months and 16 days at sea, and they were on short rations. The captain described the symptoms as pain in the feet, loss of strength down the legs, pain in the chest, difficulty of breathing and constipated bowels. There is here no evidence of scurvy, but an additional instance how fatal and epidemic the disease may become under accumulated unsanitary conditions on board ship, while on the other hand the evidence of the disease recurring without any ascobicic taint is overwhelming to this theory.

Dr. Horton in his work on on Diseases of Tropical Climates has a chapter on Beniberi, which leaves no doubt that he is describing the same disease as that which occurs in Japan. His experience of the disease was on the west coast of Africa. There, in addition to the usual symptoms, an implication
of the cerebral centres appears to be common, manifesting itself in torpor and sleepiness, so that the disease is known by the name of the "sleeping sickness of Africa." Hutton says "the mind was very much impaired & the individual spent most of his time in sleeping." A medical gentleman who heard me describe the disease in Japan informed me that he frequently seen precisely similar cases in Africa with the additional characteristic of great sleepiness.

An interesting account of Beriberi as it occurs in another part of the world is given in the Report of an outbreak of Beriberi in the Singapore Prison by Dr. Howell in the Indian Medical Gazette, 1881. The symptoms as he describes them are identical with those found in Japan with considerable accuracy. At the same time he records that in many instances little else has been complained of beyond rheumatic pains in the limbs and no sedation has existed throughout. The most quickly fatal cases have been such as were accompanied by the least visible outward sign i.e. in men of apparent health. He thus summarizes the morbid anatomy as: In the generality of cases a most striking and unusual deposition of fat throughout the body.
2) Serosa effusions into the areolar tissue throughout the body—abdomen in many cases, especially those of short duration and suddenly fatal. c) effusions in chest and pericardium. d) also in abdomen e) in ventricles of brain and surface of cerebrum, and into the spinal canal accounting for paralytic symptoms. Heart pale, congested, enlarged, flabby; valves often affected; large vesiee of coagulated lymph in heart often found; muscle of heart hypertrophied. Lungs retro- ation. Kidneys pale, large, flabby. Liver pale, friable. Brain sometimes dead, always congested. He considers that there is no doubt that it is the cord which is primarily affected; and he considers it fairly proved that Beriben is a malarial poison arising from the decomposition of organic matter in the soil, favoured and strengthened by damp and moisture and is inhaled into the system through the lungs, acting primarily upon the spinal cord. This poison is a great depressor of the vital powers, its first operation being in the quality and distribution of the blood. For this position he advances cogent reasons from the soil, structure and surroundings of the poison, and from statistics which showed its connection with increased
Heat and moisture. The prison was built on a mangrove swamp which had been filled in, the surface soil being only two feet thick, with no deep drainage. The ejection of sludge gates to a neighbouring canal caused a percolation of fluid containing organic impurities from it to the prison premises. Their ejection was contemporaneous with an increase of the epidemic, and their removal followed by the best effect. High walls around cause stagnation of the air, and the floors were near the ground. Overcrowding existed. The drinking water and food were unexceptionable.

There are the most conclusive facts that have yet been brought forward relating to the malariae origin of Beriberi.

The mention of an unusual deposit of fat throughout the body in this outbreak of Beriberi which I do not find referred to in other English writers corresponds with a mention by Wernicke of a Polynesian as well as a Hydroptic variety described by Continental writers on Beriberi. It appears to indicate a peculiar implication of the hepatic centres.

Up to this point the accounts of the disease in various parts of the world and by different observers do not differ essentially.

* A remarkable degree of obesity is noted by Christie.
in the Mauritius in 1878-9, which was called Acute Anæmic FEVER by some, The
New Disease by others, was identified with Beri-beri by one and considered to be a
form of relapsing fever by another medical practitioner. Information about the epi-
demic in Bengal is to be found in the Indian Medical Gazette 1880, in papers by
Dr. Chambers and others and in the reported discussions of the Calcutta Medical Society;
and as to the disease in Mauritius in the same Gazette 1882, in a Report on it by J. Lovel,
Chief Medical Officer, Mauritius. Precisely the same report is given by A. Davidson in the
W. Med. Journal vol. xlviii. Those who witnessed the disease in India and read the reports from
the Mauritius, and vice versa, identified the two. In Mauritius it was considered en-
tirely different from Beri-beri. In India of those who had witnessed the epidemic and
were familiar with Beri-beri, Dr. Coates distinctly denied their identity; while, on the
other hand, Assistant Surgeon Ramnay Ray in a paper on Beri-beri in the Ind. Med.
Gazette 1880 states that, having had ex-
perience of 500 cases of true beri-beri in
the Madras Presidency, and compared the
epidemic in Calcutta, he at once identified
the disease, and proceeds to describe the two
together, the description consequently varying considerably from that of those who deal only with the epidemic. As Dr. Chevers, President of the Epidemiological Society of London, has lent to this view the weight of his authority, it becomes necessary to consider it. It is incredible that so well-marked an exanthem as appeared in the epidemic should be a symptom of Reiberi, and yet have escaped all previous observers in all parts of the world. It is thus described by Chambers: "A scarlet efflorescence from the beginning of the disease, especially confined to the face, neck, upper part of thorax and extremities, or petechial spots with circumscribed nearly eruptions on face and trunk, or large purpuriic or mulberry patches. In infants, a marbled, mottled, purplish or red tinge of skin, especially of the extremities, neck and cheeks; a flushed, puffy countenance with suffused glittering eyes; throbbing of."

By Lowell it is described as "in most cases tubular eruption disappearing under pressure, sometimes ending in petechiae, or phlyctenae, and desquamation."

It is equally incredible that the Reiberi poison should have suddenly undergone
This new development.

Again the epidemic was recognized as infectious and was traced in Mauritis to introduction by Indian immigrants from Calcutta. Beriberi has never been shown to be infectious. A liability to recur is a characteristic of beriberi. The reverse is the rule in exanthemata.

Climatic influences and atmospheric changes have a notable effect in Rokke, and Beriberi generally. According to Lovell, climate and season seemed to have no influence upon its spread or mortality. It first appeared in the healthy season, after a long drought, but the change of season and the supervision of rooms did not stay its progress or modify its character.

It is according to him an acute anaemia caused by a specific microorganism using that word in its widest sense. The poison first manifested itself by its action on the sympathetic system. The vomiting and purging which ushered in the disease indicated vasomotor paralysis affecting the abdominal viscera. The clinical description given by Chambers, too long to quote here, is undoubtedly that of an acute infectious fever presenting an entirely different feature resembling pome
Kakke and from the Benikai of medical literature

Treatment. Prophylaxis consist in a general attention to the rules of health, and especially the avoidance of all such predisposing or exciting causes as have been mentioned in considering the aetiology of the disease. The exemption of foreigners in Japan is probably due to their superior health-conditions.

The treatment of the milder forms of Kakke presents no difficulty. The indication in any case is for nerve stimulants and tonics, especially strophanthid, which I generally give in combination with Quinine and Phosphoric Acid. I have found strong coffee helpful in a subacute case. Faradisation of the muscle and stimulation of the skin in the parasthetic areas with a faradic current and wire-brush, I order in all cases with apparent benefit. A continuous current from about 15 cells applied for a few minutes daily from the spine to the feet has also appeared to be beneficial in some cases.

In all cases where graver symptoms appeared, namely, signs of serious cardiac disturbance, or great debility, I resorted upon
my patients without delay to remove to a mountain air. Of the great value of a change of air all authorities in Japan are agreed.

In the treatment of symptoms or complications, each case calls for separate consideration. Dr. Anderson has found Aconite to be very serviceable for the relief of muscular pains and cramps; "given in the form of tincture in doses of 15 minims, carefully increased, it has never produced any objectionable results."

The edema calls for diuretics if it increases beyond a slight degree; large serous effusions for aspiration.

Gastric symptoms must be treated as they arise.

In the treatment of the violent cardiac disturbance and dyspnoea of acute cases, which are frequently the precursors of death, Dr. Anderson has had considerable experience. He states that drastic purgatives, when they act, "almost always gives immediate relief without producing any sensible prostration." He recommends 1-2 minimis of Croton oil with 5 grains of Calomel in the form of pill, or 5 grains of Compound Sanguis Pussill with 1/20th grain of Elaterium. In milder cases
he recommends blisters and local depletion by leeches to the chest, but in severe cases prompt resort to resection. His testimony in favour of it is so emphatic that I have extracted it in full.

Resection is the most reliable and speedy means of giving relief. As a general rule, the Japanese do not bear blood-letting well, and there would be great hesitation in adopting a form of treatment that has, deservedly or undeservedly, fallen into such utter disrepute in modern European therapeutics; but here death is so imminent that the physician need not wait to consider the remote effects of any operation which offers almost a certainty of present benefit, and, if judiciously conducted, a good prospect of entire removal of the immediate cause of danger.

The amount of depletion must be adjusted to the condition of the patient and the degree of relief afforded. If the operation be performed early, the loss of two or three ounces is often sufficient; but where there has been delay, from eight to fifteen ounces must usually be taken before an effect is produced. In all cases a too rapid flow is objectionable, as it is apt to cause faintness and create a difficulty in the estimation
of the effects produced upon the dyspnœa. In the great majority of cases the patient begins to breathe more deeply and to lose the terrible sense of anxiety, as soon as the stream has begun to escape freely, and often smiles and speaks cheerfully before the operation is concluded. The improvement, however, is not always permanent. After about twelve hours the symptoms may recur, though usually in a milder form, and a repetition of the resection or the use of one of the other measures referred to becomes necessary. Such relapses may appear three or four times in succession, and then, where the treatment is successful the danger cases. The patient may then rapidly lose all the symptoms of Kachki, or may have still to fight his way through a course of muscular hyperaesthesia and atrophy before he is able to resume his occupation.

It is interesting to observe that Christie recommended the same line of treatment by drastic and general blood-letting in Beri-beri in India.