

The patient was ill for about eight months, suffering from a more or less continuous toxemia and losing 40 pounds in weight. The prognosis for a time was distinctly unfavorable. Convalescence then set in. The effusion was absorbed rapidly, and in a few months the patient had fully regained her former state of vigorous health, which has continued to date, a period of approximately two years. The physical examination and roentgenograms one year after recovery failed to reveal evidence of a pleuritic lesion. The fluoroscope showed a slight decrease and retardation in the excursion of the right leaf of the diaphragm.

COMMENT

In apparently healthy persons the development of a tuberculous effusion following trauma of the thorax is usually thus explained: A latent or healed tuberculous focus of the pleura prior to the injury is assumed, except in those instances in which the bacilli gain access to the tissues through an abrasion or wound at the time of the injury. Pathologic studies have demonstrated the frequency of latent foci of the pleura in persons dying of causes other than tuberculosis. It has also been shown that these healed foci may, and often do, harbor living and virulent tubercle bacilli. It is supposed that the trauma causes a rupture of the fibrous capsule about the focus, and that living tubercle bacilli and their products then escape through the tear into the pleural sac. The extent of the effusion and the rapidity with which it develops depend on the number, virulence and distribution of the tubercle bacilli over the pleural surface, and on the allergic state of this tissue.

The clinical data in support of this theory, so far as I have reviewed the literature, is not conclusive. In the recorded cases, the tuberculous focus was not detected prior to the injury, but its presence assumed after detection of the effusion. Furthermore, the time interval between the trauma and the recognition of the effusion in most instances was sufficiently long to admit of the possibility of other causative factors.

These criticisms are not applicable to the present case, since a latent focus of the pleura was recognized several years previous to the injury, and its reawakening by trauma was apparently established from the clinical notes submitted.

At the time of the injury the patient was stooping forward, the left hand raised slightly above the body grasping a limb for support, and the other stretched forward lifting the child (55 pounds in weight) from the water. This effort imposed a severe strain on the muscles of the back, especially those of the right side, and no doubt resulted in the tearing of pleural adhesions, which would account for the sudden and severe pain in the chest. As tubercle bacilli were discovered in the effusion, one may assume that with the tearing of the pleural adhesions, tubercle bacilli were liberated and distributed over a greater or less area of the pleural surface. This was followed by an acute inflammation with rapid accumulation of fluid.

The case, therefore, is of interest in giving added support to our ideas regarding the development in apparently healthy persons of a tuberculous effusion following trauma. It also tends to confirm clinically Paterson's¹ experimental observations as to the possible recovery of the pleura in guinea-pigs from a marked tuberculous involvement. Furthermore, the realization of the untoward results that may follow a wrench

of the chest muscles, and the fact that a well established tuberculous effusion does not necessarily mean permanent disability, is important from a medicolegal standpoint. Finally, as tuberculous effusion following trauma is not uncommon, the detection of benign lesions of the pleura should receive careful consideration before accepting men for active military service because of their frequent exposure to injury and the possibility of reactivating lesions of this nature.

OBSERVATIONS ON THREE CASES OF
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The winter of 1916-1917 was passed in Melville Island by seventeen members of the Canadian Arctic Expedition. The expedition vessel, the *Polar Bear*, had failed to reach the island and we expected to live the winter entirely on fresh or dried musk-ox, reindeer, seal and bear meat. During the darkness of winter, however, our sleds got their steel shoeing worn out through a traveling party getting lost among some rocky hills where the sleds had to be dragged scores of miles, mainly over rock. This necessitated my sending a party in midwinter to Winter Harbor on the same island (where in the past several vessels have wintered) to see if they could find abandoned iron or steel and shoe the sleds for the spring work. Some of our people made another trip to the same place during the winter for a different purpose.

At Winter Harbor our men found, besides the metal and other repair materials wanted, several tons of food, kerosene, etc., cached there in 1910 by Captain Bernier, then in the Canadian government service. It was against my judgment, because of fear of scurvy and because of trouble in freighting the food, to use any considerable quantity of these edibles at our winter camp; but the men had an idea that the cached foods were much preferable to meat, and so I allowed them to eat all they wanted of these groceries while at Winter Harbor, though the amount hauled to the base camp and eaten there was less than three full meals per week—one full meal per week would be nearer the actual fact.

The main items of food found at Winter Harbor were flour, salt pork, butter, honey, sugar, pilot bread, preserved fruit in glass containers, pemmican, meat extract, dried fruit, rice, beans and peas. So far as we could judge, all of this food was in perfect condition except the pork and the sugar. Much of the brine had leaked out of the pork barrels, and as they were above the sugar, some of the brine had permeated most of the sugar so that the taste of it ranged from barely perceptible saltiness when used in tea to saltiness that made the sugar disagreeable no matter how used. There may have been a little sugar unaffected. The pemmican was salted to be palatable to the ordinary eater; the meat extract seemed to consist in considerable part of rock salt, some of the particles nearly the size of a split pea. There was also some salt which those of the men who cared for it used with the fresh meat.

On account of their greater portability, I decided to use the groceries found at Winter Harbor along with dried meat and fat on the sledge exploration of

1. Paterson, R. C.: Pleural Reaction to Inoculation with Tubercle Bacilli in Vaccinated and Normal Guinea-Pigs, *Am. Rev. Tuberc.*, 1917, 1, 353.

the spring of 1917. The dried meat yields to no food in portability if used with the right amount of tallow, but as we had to feed some fifty dogs on it as well as the men we were short and should have had to use half dried or green meat in part had we not found the cached groceries. I did not fear scurvy from this use of the groceries, as I expected the men to eat mainly fresh meat all winter and we would have some seal meat on the ice in the spring. But I reckoned without the fact that some of our men had the belief that a varied diet is necessary for health. That phrase may be all right if properly understood; but certainly it is not only untrue as commonly understood by laymen but dangerous when applied on polar expeditions by the ordinary cook or even by that type of doctors who inherit their views of scurvy and antiscorbutics from Captain Cook's voyages. On this point witness the prevalent scurvy of the carefully groomed, dieted and medically supervised Scott expeditions and the absence of it on the (dietetically) apparently haphazard expeditions of Peary and Shackleton.

Of the five men who went to Winter Harbor in midwinter and there lived for several weeks mainly on the diet given above (the cached stores), three were afterward transferred to parties that lived in considerable part on fresh meat through February and March, and none of them ever contracted scurvy. The other two worked at freighting the groceries to the north coast of Melville Island and (I later learned) ate fresh meat rarely and as only one item of their meals. They also used salt extensively both as direct seasoning and in the form of beef tea from the meat extract. Both these got scurvy late in March or in April. No one else of the seventeen in Melville Island had any symptom of scurvy.

In March, our Melville Island party was joined by Lorne Knight, who had wintered with the *Polar Bear* in Victoria Island and whose diet had been mainly groceries of the ordinary kind, with a little fresh meat now and then, cooked in the ordinary white man's way.

After Knight joined our party, it was subdivided into two sections traveling one behind the other on the same trail, a few days apart. In the advance party were Aarnout Castel (in command), Karl Andersen, Lorne Knight, Harold Noice and one Eskimo; I learned later that the diet of this party had been mainly rice, pilot bread, pemmican, meat extract, sugar (salty), honey and a little fresh meat, cooked. The Eskimo, in addition, occasionally ate some raw fresh meat kept for dog feed. Castel ate the salty, cooked food, but he had previous to taking command of this party lived nearly exclusively on meat all winter, some of it eaten raw and little salt used. He and the Eskimo never acquired scurvy. The second party, that traveled behind, had a diet differing from the first in less use of salt and more of meat, both cooked and raw. No one in that section developed scurvy at any time.

Early in April, Andersen, when my party caught up to the advanced section, complained to me of having been gradually becoming more unwell for a week or two. The first symptom noted by him was dizziness on suddenly standing up, "laziness," gloom and irritability, showing itself in a tendency to condemnatory and uncalled for argumentativeness, proneness to becoming tired, and loosening of the teeth and a swelling and recession of the gums, with a dull, local ache

in the gums or roots of the teeth. The appetite was normal as to both quantity and kind of food desired except that there was an increased aversion to frozen, raw meat—occasionally eaten by most of us in the form especially of frozen liver, a dish few persons can try several times without acquiring a liking. I told Andersen at once that the case looked like scurvy to me, but I added, "It can't be, for you have lived on fresh meat most of the winter." To this he replied, "No, sir, it can't be"—a dutiful reply, but not enlightening. So I decided the gum condition to be pyorrhea alveolaris, and we acted accordingly. I sent Andersen south with the first returning support party going toward our base at Cape Kellett, Banks Island.

I learned later that on the way south Andersen's symptoms continued to develop along the same lines, and he lost gradually in strength. On reaching Melville Island, the party failed to find food at an expected rendezvous, and for two or three days they had been on short rations, arriving without food at a place where several musk-oxen had been killed and one left behind unskinned and intended for dog feed. The coat of this animal is so warm that in the coldest weather of winter, decay for several days proceeds on the basis of the body heat before being arrested by frost. This animal was therefore very "rotten," but the party was hungry and promptly devoured considerable of the frozen meat. All men who know the two methods prefer very high meat raw and frozen to the same meat cooked, and so our party ate most of their food raw for some days. Andersen told me the following summer that after three days of the raw meat he was completely over his abnormal gloom, felt eager to exert himself (as exemplified by a willingness to get up in the mornings, whereas he had formerly to "drag himself out of bed"), he could stand up suddenly without dizziness; and a soreness and stiffness of the joints, lately a prominent symptom, had disappeared. All this had occurred in three days. On a continued diet of meat, sometimes raw, sometimes cooked, but always fresh after the first four or five days, he continued to improve. His full strength came back in two weeks and his gums were firm and his teeth fast in a month. No salt was used, for they had run out of it.

In complete ignorance of the progress of Andersen's disease and of his recovery, my own party proceeded out on the moving sea ice and to a point 140 miles from land. Here scurvy, this time promptly recognized, laid hold of two of my three companions, Knight and Noice. What helped me to a quick decision as to what the trouble was was Noice's telling me that at times, when they were working separated from me, they had eaten practically no fresh meat for a considerable part of the winter, and had been eating everything heavily salted, partly (apparently) as a protest against what they considered my unreasonable instructions that meat should be the main item of diet and salt used sparingly, though both "white men's food" and salt had been found at Winter Harbor.

Noice, who had been on the Winter Harbor diet, and Knight, who had been on the ship's diet, had about the same symptoms, and these were the same as in Andersen's case. Noice's disease, however, was about a week farther advanced than Knight's. We at once started for land, for seals were scarce where we were, and fresh meat not available. I ceased using any salt or

salty food, and for the first week of the journey shoreward the symptoms remained about at a standstill. After that, however, the disease made progress again. The diet at this time was hard bread, rice, pea meal, honey, sugar and casein. What fat we had we used for the dogs.

Before reaching shore, Noice had become unable to walk and had to be hauled on the sleds; Knight was able to walk, but was getting weaker and more wretched. On landing on Ellef Ringnes Island, I at once went inland in search of caribou, the others traveling along the coast to keep abreast of me. On the second day, fourteen caribou were killed, and we pitched camp at the place.

At this time the teeth of both men were so loose that they could be plucked out with the fingers with no effort, and the gums were of such a cheeselike consistency that they were cut (with little bleeding) by wooden toothpicks about as easily as ordinary "American" cheese could be. Every joint was sore and all movements painful, and there was a gloom which, both men later agreed, could not have been caused by mere worry over their danger—we were 700 miles from our vessels and 600 from the nearest Eskimos. There was a marked craving for salt, in consequence of which I threw away a pound of salt we had with us and a little remaining meat extract, to prevent the men eating them surreptitiously. Appetite and digestion seemed normal, except that there were the above-mentioned craving for salt and a pronounced distaste for raw meat—greater distaste than ordinarily. I now put them on this diet: In the morning a potful of meat was boiled, without salt, in enough water to supply drinking needs all day. The boiled meat was all consumed at breakfast, and when they were hungry enough (which was soon), raw frozen meat was eaten as often as desired the rest of the day. This meant that from half to two thirds of the meat was eaten raw. Marrow was also eaten raw.

In three days of this diet both men felt as cheerful as normal, and instead of the previous disinclination to stir there was a desire for activity surprising in view of the weakness from which they had not yet recovered. The pain in the joints was nearly gone, the craving for salt was markedly less, and the appetite for raw meat was much improved. In fourteen days from the first meal of meat, both men were able to walk, and we started south. In another two weeks their teeth were secure and the gums hard, though they did not, of course, regain their former apposition or contours.

All these men have been traveling all winter, having exercise that amounted to hard work, and fresh air night and day. None of them took a bath shortly before, during or immediately after their illness.

I have found among medical practitioners in Alaska that, with the prejudice in favor of fruit and vegetables as antiscorbutics inherited from Captain Cook's interesting observations, they have neglected meat as a preventive and curative agent in general throughout the territory. This led to many uncalled-for deaths while vegetables were as yet not readily obtainable. Fresh meat and fish always have been readily obtainable in most places.

Apart from some cases of scurvy that I dealt with in an article published last May,¹ I have seen in addi-

tion to the foregoing case only my own. I knew in advance I was likely to get scurvy during the winter of 1917-1918 if I continued on the diet forced on me by local conditions in the Mackenzie delta, where I was buying dogs, but I intended to counteract this by a prompt change to a meat or fish diet as soon as that task was done. But just then I was taken with typhoid, followed by pneumonia and pleurisy; and the diet approved and forced on me by those under whose charge I was while extremely ill was one by no means calculated to counteract scurvy—ordinary canned milk. But as this case, both in its cause and cure, differs markedly from the foregoing, I shall decide that space does not warrant my including a full account of it here.

CONCLUSIONS

The present article, together with the one just mentioned, and considerable material gathered but not published, makes clear some conclusions and suggests others. While these may not be exactly new, it is to be judged by the confused nature of many medical works still in use for reference by physicians that further testimony would not be amiss.

It seems, then, that:

1. The strongest antiscorbutic qualities reside in certain fresh foods and diminish or disappear with storage by any of the common methods of preservation—canning, pickling, drying, etc. Fresh tomatoes may be valuable (I have never tried them), but canned tomatoes are of little or no value; fresh potatoes are good, but desiccated potatoes have shown little or no adequacy in our expedition when tried in my absence by believers in that form of diet; the juice just expressed from the fresh lime is said to be excellent, and I have no reason to doubt it; but bottled lime juice has never yet prevented scurvy. (I have just recently gathered interesting but scarcely needed testimony on this point from the Royal N. W. Mounted Police as to the scurvy winter of 1898-1899 at Dawson).

2. Cooking lessens or destroys the antiscorbutic value of most or all foods. Three average raw potatoes are commonly said by miners definitely to turn the tide of scurvy that has not reached an extreme stage; in our own expedition, boiled and roasted fresh bear meat did not relieve scurvy except with such slowness that it is debatable just what its effect was, if any. Our party and persons known to me have had the same experience with venison. I am of the opinion that most men, if left to their own inclinations and supplied with abundant cooked, fresh meat will avoid scurvy; cooked meat acts but slowly on an advanced case—the efficiency of it depending probably on the "rareness" of the cooked meat.

3. Meat and fish slightly or well advanced in the process of ordinary putrefaction seems to be as good an antiscorbutic as fresh flesh, or nearly so—witness Andersen's case above and the well-known fact that Eskimo tribes often live for several months in succession on putrid meat or fish without ever developing scurvy, while Eskimos working for white men or living on purchased provisions have it quite as readily as Europeans living on the same sort of diet.

4. Bodily cleanliness and ventilation are not by any facts known to me shown to have any bearing on the incidence or severity of scurvy. Here it is instructive to compare the filth and good health of Nansen and Johansen, as described in "Farthest North," with the

1. Stefánsson, Vilhjálmur: *Original Observations on Scurvy and My Opinion of the Medical Profession*, Med. Rev. of Rev., 1918, 24, 257.

immaculate Scott expeditions with their numerous and serious scurvy cases.

5. Exercise does not prevent scurvy. I have been told, verbally, that the Scott party had it on the return from the pole, after months of continuous and strenuous work in the purest of pure air and in abundant, continuous sunshine; while Nansen and Johansen were in perfect health after a winter of the most nearly absolute inactivity ever known to me to have been described in a book of travel. These are not isolated but typical instances.

6. Salt, while not proved by anything I know to be a cause of scurvy, probably has some direct bearing on the history of the disease, for the following reasons: (a) Salt meats have long been recognized (and probably rightly) as predisposing to scurvy. (b) Many observers have commented on the hankering for salt by scurvy patients and on the disappearance of the longing as the cure proceeds.

Neither am I certain that salt did not cooperate with the heat in lessening the antiscorbutic value of the meat used by four of our eight scurvy patients. The only death and the only long and dragging recoveries were of men who ate their meat cooked and salted during or after cooking. This was at the winter camps which, while they belonged to our expedition, were not at the time under my personal observance, and I have the stories on hearsay.

7. It is a mistake to think (with most laymen and many physicians) that blackening the skin of the leg and softening of the calf muscles are among the early symptoms in nearly all cases. I have never seen either symptom, and in the cases I have heard of from reliable observers these symptoms, if they appeared, appeared late in the disease. Dizziness on standing up and bleeding from the gums are commonly among the earliest symptoms noted by the sick man himself, though it may be right that careful tests would disclose other symptoms earlier.

Harvard Club.

Birth Statistics.—According to an advance report of the Bureau of the Census, during the year 1916 in the recently established birth-registration area of the United States, with an estimated population of about 33,000,000, or 32 per cent. of the total population, the birth rate was 24.8 per thousand of population. This area comprises the six New England States, New York, Pennsylvania, Maryland, Michigan, Minnesota and the District of Columbia. The number of infants born alive was 818,893. The total number of deaths in the same area during the same period was 486,482, or 14.7 per thousand. The births, therefore, exceeded the deaths by 68 per cent. It is said that in all the states and all the cities, and in practically all the counties of the birth-registration area, the births exceeded the deaths, usually by considerable numbers. The deaths of infants of less than 1 year averaged 101 per thousand of living births. The birth rate for the entire registration area fell below that for 1915 by 0.1 per thousand of population, while the death rate exceeded that for 1915 by 0.7 per thousand. Without migration and with the birth and death rates remaining constant in the area to which they relate, the annual increase in population would be about 1 per cent. This rate compounded for a decade would give a decennial increase of about 10 per cent., or about half the rate of increase in the population as a whole between the last two censuses, which was 21 per cent. More births occurred to foreign-born white women than to native white women, amounting to as much as 62 per cent. in Connecticut. The death rate among infants of less than 1 year was practically the same in 1916 as in 1915—101 to 100 in the latter year. It ranged from 70 in Minnesota to 121 in Maryland.

PARALYSIS OF THE SIXTH CRANIAL NERVE ASSOCIATED WITH OTITIS MEDIA*

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In the routine practice of ophthalmology when patients present themselves with extra-ocular muscle paralyses which have developed suddenly, one is inclined to be content with inferring probable syphilitic etiology or some toxic cause, in case there is no history of traumatism. This habit of practice has led too often to the neglect of a careful search for a definite underlying cause and a definite pathologic lesion.

There are many conditions that may be responsible for paralysis or paresis of the third, fourth and sixth cranial nerves, and the whole subject is full of interest; but I wish at this time to call attention definitely to paralyzes of a single nerve, namely, the abducens, which occur rarely but unmistakably in the course of purulent otitis media.

In 1904, Gradenigo¹ described a symptom complex which is now known as Gradenigo's syndrome or triad. It is characterized by (a) acute otitis media (with or without external suppuration, and with or without mastoid reaction); (b) isolated paralysis or paresis of the abducens nerve of the side corresponding to the diseased ear, and (c) intense and extraordinarily persistent pain localized, not as ordinarily in the mastoid region, but in the frontal, temporal and parietal regions of the same side.

The following case is a clean-cut example of the type:

M. W. S., aged 11, a thin and rapidly growing girl, called at my office, June 9, 1917. Two years before she had been a victim of mastoiditis on the left side and the mastoid was successfully operated on by Dr. John D. Richards. For the last six weeks she had had a running ear on the right side and was being treated conservatively by Dr. Philip D. Kerrison. The child was brought to me on account of double vision, which she overcame by closing the right eye, and very severe pain in the right side of the head, which was most intense over the right eye. Examination revealed complete paralysis of the right external rectus. Gradenigo's syndrome was clearly exemplified, and the condition was reported to Dr. Kerrison, who thought best to perform the mastoid operation. Two days after the patient visited me, the mastoid was cleaned out and it was found to be of the pneumatic type; but nothing unusual was found in spite of careful search for a lead to the sixth cranial nerve. The next day after operation there was decided improvement in the diplopia, and on the third day the diplopia and the pain had entirely disappeared, not to return again. I saw this patient last, Dec. 8, 1917, and at that time the muscles were in balance, and the tropometer showed normal rotations.

Recognition of the symptom group is found in otologic literature by the detailed reports of numerous cases which adhere more or less closely to the definite Gradenigo type; but case reports in eye literature are few, and there is surprisingly inadequate reference to the association of isolated sixth nerve paralysis with otitis in our textbooks and journals, and one is led to believe that the importance of this association has been

* Read before the Section on Ophthalmology at the Sixty-Ninth Annual Session of the American Medical Association, Chicago, June, 1918.

1. Gradenigo: *Tr. Cong. de Bordeaux*, 1904.