13. Diet in fibrositis and osteo-arthritis is not specific, but is often of importance in so far as it may reduce obesity, prevent cardio-renal degeneration, or preserve the patient from metabolic disturbances due to indigestion.

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SEA BATHING IN THE TREATMENT OF SURGICAL TUBERCULOSIS*

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It is strange that while the value of properly planned sun bathing in the treatment of surgical tuberculosis is now universally recognized and applied, comparatively little attention has recently been paid to sea bathing in this disease. Yet it has a very real claim on our consideration.

Two Pioneers of Sea-Bathing Treatment

It is unnecessary to go at length into the history of sea bathing from its therapeutic aspect, but mention must be made of two of the pioneers in its use: one Lettsom, a physician of great distinction, who was a founder of the Medical Society of London and of the Sea Bathing Infirmary at Margate; the other, now almost forgotten, a certain Dr. Richard Russel, generally called "Seawater Russel," who was born in 1687 and died in 1759. Russel wrote two books on the efficacy of sea bathing and sea-water drinking in the cure of various diseases, more especially in tuberculosis of the glands, bones, and joints, and scrofulous diseases generally. He claimed that he wrote from the outcome of years of observation. He said that he had noticed that fishermen rarely had scrofulous diseases, and that their women had good complexions, beautiful teeth, and sound gums. He described how children who were delicate and pale, overclad and glandular, when sent to him for treatment, had been returned to their parents after sea bathing, bare-necked, bare-headed, tumours of the neck cured, and countenance healthy. He supports his claims with convincing details of many cases successfully treated. Doubtless a measure of his success was due to necessarily synchronous sun bathing, but the value of sunlight appears to have escaped him. He practised at the little village of Brighthelmstone, now Brighton, which owes to him its popularity, and it is worthy of note that Russel's first book made him famous at the advanced age of 63. His success was instantaneous and amazing. Sea bathing became a popular and fashionable cure, and its devotees soon turned it into a national pastime. Everyone who was anyone essayed cure by dipping into the brine.

The value of the summer holiday by the seaside is now such an accepted fact in English life that it is difficult to remember that it was unknown until the reign of George II, and only became really popular when George III made Weymouth "Royal." Before Russel died he had made the reputation of Brighton, and it has continued to rise steadily in favour and popularity. Russel's works had an enormous vogue both at home and on the Continent. But in England the pleasures of sea bathing became so overwhelming that its therapeutic

effects were soon forgotten. On the Continent Russel's books were still read well into the nineteenth century, and Michelet, in his poem, *La Mer*, calls him "Inventeur de la Mer"; there seems no doubt that he was the father of all seaside pleasure resorts.

Lettsom, much impressed by Russel's work, founded the Sea Bathing Infirmary, now the Royal Sea Bathing Hospital at Margate. As Johnston Abraham says in his delightful *Life of Lettsom*, from which I have freely quoted, Lettsom's fame is made secure by the fact that he is the father of all the open-air sanatoria throughout the world, because he founded the Sea Bathing Infirmary. Continental observers have grasped this, and it does not matter in the least that it was thought that sea water rather than sunlight effected cures at Margate. From the start this hospital had an open-air solarium for the patients, suggested and insisted upon by Lettsom, who had a passion for sunlight and fresh air.

An Experiment in France

Following the Napoleonic wars an increased and virile population became an essential requirement in France. Tuberculosis was rife in both its pulmonary and its surgical forms. Measures to combat and, if possible, to cure the disease engaged active attention. A commission appointed by the French Government heard rumours of the success of a fishwife at Berck-sur-Mer, a tiny fishing village near Boulogne. Her methods were investigated, and it was found that she cured scrofulous and deformed tuberculous children by the simple method of merely exposing them to sun, air, and sea water on the wide beach at Berck. The hint was taken, and a large municipal hospital was erected at Berck, to be followed by numerous other institutions. These continue their beneficent work to this day; but a point of great interest, common both to Margate and to Berck, is that while the value of heliotherapy is increasingly admitted and utilized, sea bathing has been neglected and as a therapeutic measure almost forgotten and abandoned. It is my purpose to emphasize its value and explain the technique of its practice.

My own interest in, and love of, sun and sea bathing dates from childhood, and I attribute much of the good health which I have enjoyed to long summer holidays, both as schoolboy and as student, spent on or in the sea. When it fell to my lot to start the Cripples' Hospital at Alton in 1908 I immediately practised sun treatment on the children under my care, and I would remind you that sun bathing for therapeutic purposes was at that time unknown in England. Similarly, as soon as the hospital was able to secure a marine branch, I started sea bathing as a therapeutic measure.

The Marine Hospital in Treatment of Tuberculous Cripples

It is well established that during a long and trying illness climatic change and altered environment may often be utilized with advantage. For the children of the well-to-do that is a simple matter, but the need exists equally for the hospital patient. It was to meet this need that we established a marine branch at Hayling Island. The advantage of having two institutions, the one inland and the other at the seaside, under the same management and control, so that continuity of treatment as well as climatic change may be satisfactorily ensured, must be obvious. But there are certain desiderata in the site selected that should be fulfilled. The climate should be mild and equable; there should be abundant sunlight of high actinic value; the rainfall should be low; there should be absence of mists and fogs, and there should be no atmospheric or water pollution. The hospital should be situated right on the beach and in the closest proximity to the sea safely attainable. It should be remote from a town, so that patients have unrestricted

* Presidential address to the Section of Public Health at the Annual Meeting of the British Medical Association, Melbourne, 1935.

use of the beach for the purposes of treatment and pleasure without interference from visitors. At the same time, by ensuring the absence of visitors the patients themselves are not a source of annoyance, repulsion, or even possible danger to others. As many of the patients are cripples not only must the hospital be situated right on the beach for convenience of access to the sea, but the littoral must be flat, with absence of cliffs or rocks for the safety and comfort of the patients. There should be an extensive beach with wide excursion of tide to ensure cleansing, and the hospital should be so situated that the prevailing wind blows across the moist sands charged with substances known to be stimulating and tonic. Nevertheless the hospital should be so placed that it is in no danger from exceptionally high tides, heavy seas, or gales.

Actually, our marine hospital faces south-east, from which quarter winds rarely blow, and they never provoke heavy seas. The prevailing winds are from the south-west, so that sand is never blown into the hospital, but always away from it, and is not a cause of annoyance or discomfort to the patients. This important point is frequently overlooked. Moreover, the hospital facing south-east has all the benefit of morning sun and reflected ultra-violet light from the sea, so therapeutically valuable. Hayling Island is the sunniest district on the sunny south coast of England, and has the lowest rainfall. To the south-west is the Isle of Wight and north of it are the South Downs. Its low rainfall is explained by its geographical situation. The rain clouds coming up the English Channel are attracted by the hills of the Isle of Wight, and deflected to the North Downs, north of Hayling Island. Often rain may be seen falling north of the island while it is quite dry and cloudless on the island itself. The rainfall is nearly 50 per cent. greater ten miles north of the island than it is at Hayling. Also, the sandy, absorbent soil rapidly removes any rain which may fall. The climate is mild but bracing and equable, and this in conjunction with the low rainfall and abundance of sunshine of high actinic value renders it especially suitable for open-air treatment all the year round. The hills already alluded to, north of the island, besides diverting rain protect the hospital from cold winds from the north.

The hospital property is in the form of a peninsula, so that it has sea and $1\frac{1}{2}$ miles of beach practically all around it. The island is situated at the entrance of a wide land-locked bay, from which stretch inlets extending far into the land. This bay has to be filled and emptied twice daily by the tide, which races past the hospital, scouring the beach with pure sea water from the English Channel. The site of the hospital, which is unique, was chosen after careful examination by car of the whole of the south coast of England, from the mouth of the Thames to the mouth of the Severn, and in our crowded little island it is a source of satisfaction that so suitable a site could be found so admirably adapted for the needs of a marine hospital. Doubtless in Australia many equally suitable sites, with convenient access to towns, are to be found, but in England no comparable site, so far as I am aware, is anywhere available.

The patients are conveyed to the Marine Hospital from the parent hospital at Alton by motor ambulance. The nurses likewise come from Alton to serve for periods of from three to six months, and thus are fully conversant with the nursing methods we employ. The short period of their stay at Hayling renders it attractive; many of the nurses bathe all the year round, whereas if they were permanently employed at Hayling its remoteness would render it less desirable and more monotonous, and difficulties in staffing would be increased. I personally examine each patient at Hayling at least once weekly.

Type of Case Sent to the Marine Hospital

By the establishment of two hospitals, one inland and the other marine, under one management, with complete control as to the type of case sent to each, much information of considerable value has been acquired as to the type of case likely to obtain the greatest benefit from marine treatment. I had hoped that the more weakly patients who were responding only very slowly to treatment would improve rapidly, but that is rarely the case. The weakly, cachectic, freckled, marasmic child, the child with a muddy complexion, lethargic in habit, who does not bronze readily on exposure to sunlight, with little power of response to natural stimuli, rarely does well. Very few sick children under the age of 5 derive real benefit; for these the less vigorous and clamant conditions prevailing inland are to be preferred.

A little consideration makes the reason obvious. The stimulus of sun, open air, tonic sea breezes, and sun bathing makes too heavy a call on their vitality: they have not adequate power of response. The nature and extent of the lesion matters little. The whole success of marine treatment of these cases depends entirely on the ability of the patient to respond to the strong stimuli supplied. Those who cannot respond satisfactorily are exhausted in the effort. They become quieter, and often peevish and irritable. They need more food, but are unable either to digest or to absorb it. They often vomit, are bilious, and, as colloquially described, "liverish." They feel tired without understanding the cause of their fatigue. They are in a katabolic rather than an anabolic state, and hence they tend to waste and get thin. Their skin becomes dry and harsh, and the subcutaneous fat is rapidly lost. Frequently there is slight and irregular pyrexia. These symptoms at times are alarming, and can only be remedied by prompt return inland. Experience has taught us readily to recognize such cases at Alton, and these children are not sent to the seaside until their powers of response to natural stimuli have been so fortified and attuned that we know when they have reached the stage of vigorous potential and desirable reaction.

I have stressed the case of children in my experience found unsuitable for marine treatment because it is of extreme importance to avoid disappointment and failure. Naturally, there will be a considerable intermediate class who will do well under healthy and hygienic conditions, both inland and at the seaside, and others, who, if carefully supervised at first, will gradually acquire the necessary power of response to marine conditions, either wholly or partially applied. Suitable cases and cases likely to respond well are children of good constitution, who, even if their local lesions are causing anxiety, can react satisfactorily. Children doing well over the age of 5 years, with good digestion, who sunburn readily, who are braced by exposure to cold air, and who react to natural stimuli inland will, in almost all cases, do better still at the seaside.

Especially interesting is the improvement observed in children responding well to sun treatment inland, but who reach a point where further progress is arrested. In these still more rapid progress and acceleration of cure is often observed when they are transferred to the sea, and that to a remarkable degree.

Effect of Open Air and Marine Treatment on Basal Metabolism

Working at Alton and Hayling Island, Sir Leonard Hill and Dr. Argyll Campbell showed that the basal metabolism of the patients under our care was gradually and safely raised, and that after two to three months' treatment the average basal metabolism of recumbent Alton

patients was 40 per cent. above that of the average child. This increase of basal metabolism is not due, as has been supposed by many, to sun treatment, but to exposure to cold air, and it occurs equally in summer and winter if patients are appropriately handled. Excessive continuous increase of basal metabolism is often harmful and is to be deprecated. Children should not be exposed to such an extent that they shiver and complain of cold. Their skin, during exposure, should feel warm if they are reacting properly. Sudden and temporary increase of basal metabolism is highly beneficial if followed by a feeling of well-being and exhilaration. Beyond that point it must not be pressed.

Marine treatment offers the readiest means of so influencing basal metabolism. Controlled loss of heat from the body following exposure to cold air or water necessitates the generation of heat in the body. Work has to be done. More food must be consumed, digested, absorbed, and built up into the tissues. Increased oxygenation is called for, and there is greater elimination of waste products through the lungs, the kidneys, the skin, and the bowels. This increased tissue change takes place not only in healthy but also in diseased tissues; hence the process of repair in tissues diseased is intensified and expedited. While exposure to cold air raises the basal metabolism to a point, more effective and more easily controlled increase of basal metabolism is obtainable by spraying, paddling, or immersion in cold sea water. Such treatment is of the utmost value to those patients who can make adequate response. It should be followed by a feeling of well-being and exhilaration. The skin should glow and be warm. If, on the other hand, the patient is cold and shivers, his teeth chatter, his circulation is impaired, his face is blue and pinched, his fingers are white and bloodless, obviously harm may be done; a satisfactory reaction has not been obtained, and the treatment for such a patient is totally unsuitable and to be deprecated. But given a patient capable of responding suitably to immersion in the sea, the basal metabolism may be raised during the bathe to no less than 1,000 per cent. above the normal. Such an increase of basal metabolism may seem almost incredible, but it nevertheless occurs, and in selected cases is of the utmost value to the patient.

The patient may be said to enjoy the effects of the most skilled general massage without himself moving in any way, and administered more perfectly than could be accomplished by the best masseur. This effective exercise without movement cannot but be beneficial to a child who, by the very nature of his disease, a tuberculous arthritis, must of necessity remain immobile. But under the influence of sun, sea air, and sea water, muscles long atrophied fill out and become firm and hard, the patient enjoys a sense of physical well-being, and an important aid to cure has been accomplished.

Technique of Therapeutic Sea Bathing

The selected child, on arrival at the marine hospital, is first acclimatized and gradually exposed to sun and sea breezes. If the ill effects which unsuitable cases show are not apparent, he (or she), if ambulant, is allowed to paddle for short but increasing periods in the sea daily, care always being taken to see that the child is not fatigued. Later the body is sprayed with sea water, and, finally, but only after some days and if the patient reacts satisfactorily, total immersion is permitted. If the case is an ambulant one, the patient bathes within a net which has been pegged into the sands. This is a wise precaution, for while it allows the free flow of fresh sea water (and it is fresh and uncontaminated sea water which is needed), all danger is avoided and the child is under suitable control and restrictions.

A porter in waders is always present in the water with the children, and a sister, with nurses in attendance, stands on the beach to supervise the bathing, direct the children when to return to the shore, and undertake the necessary treatment after the bathe. Children who cannot walk are carried into the sea on netting stretchers laced on to an iron frame and dipped into the water one or more times as may be ordered. After a week or two they are allowed to remain immersed in the sea for increasing periods as may be found advisable.

Paddling or spraying is not, as a rule, permitted until the temperature of the sea reaches 58° F.; total immersion is allowed when the temperature reaches or exceeds 60° F.; the optimum temperature is usually between 65° and 68° F. When the temperature is lower than the minimum permitted, sea water should be heated to the temperature desired, but one has the impression that unheated water is best, and in any case the water should never be heated above about 70° F. Warmer sea water becomes less beneficial; it is sticky and unpleasant to bathers, and is increasingly enervating and decreasingly stimulating.

At Hayling Island the rising tide is to be preferred to the falling tide—it is fresher, more saline, and more invigorating—but if this is inconvenient bathing on the falling tide is permissible. The best time for bathing is about two to three hours after breakfast, and if it is a bright sunny morning and there is a rising tide as well then good results may be anticipated. The temperature of the sea is usually a little higher on the rising tide in the winter and lower on the rising tide in the summer. We have now constructed a bathing pool so that we are independent of the vagaries of tide and able to select the time for bathing which experience has shown most suitable.

What Happens During the Bathe

The patient on immersion experiences a cold shock. The surface of his body is rapidly cooled, there is superficial vaso-constriction, and heat is rapidly abstracted from the body. The child involuntarily gasps for breath, the lungs are fully distended with pure sea air, and more heat is abstracted via the respiratory organs. The rapid and deep respiration is of considerable benefit; there is increased excretion from the mucous membranes as the child spits and splutters. Associated with this is an immensely increased oxygenation of the tissues with a correspondingly greater elimination of carbon dioxide.

Bathing has also valuable diuretic properties. The heat-regulating mechanism comes into play; there is profound alteration in the circulation and richly oxygenated blood is pumped through the body. Initially the best effects are produced by a short bathe, but later a longer period is required in the water, to the evident enjoyment of the child, who splashes, paddles, and learns to swim with obvious delight.

After the Bathe

It is now our purpose to get the greatest possible reaction. The child is taken from the sea and placed in a pen with a warm planked floor and wattle hurdle surround. The latter, while completely obstructing the wind, allows free circulation of air. There is no covering over the pen. In the centre is a large iron brazier, in which a coke fire is burning brightly, radiating welcome and pleasing heat. Along one side of the pen is a wooden trough containing warm water. The child is wrapped in a warm bath towel, well dried before the brazier, and then sits with his feet in hot water and is given a warm drink. Rapidly he becomes warm and glowing. The place resounds with merry laughter. Those who are able to do so link arms and dance round the fire, and then all rest for a quarter of an hour in the warm pen, and

afterwards play on the beach in the bright sunlight till dinner comes along, and an abnormal amount of food is consumed with eager voracity. There follows a period of rest while the food is being digested. The technique for those who cannot walk is much the same, except that their bodies are sponged with warm water instead of having their feet placed in the trough. They, too, enjoy a sun bath after the initial period of rest.

Effect of this Treatment on Patients

Again I would emphasize the need to select patients suitable for the treatment outlined above. Almost all will sooner or later benefit by it, but in many cases we may have to wait a considerable time before it can be applied with advantage. To get the best results I insist upon short immersion in cold sea water rather than long immersion in warm sea water. For English children certainly the cold of the fresh English seas is more suitable than the warm but enervating Mediterranean, and, indeed, I have found the same to be true for children who come from the Tropics. In all of them there is greater metabolic activity, repair is hastened, muscular tone is improved, recalcification of lesions is stimulated, tuberculous glands are more rapidly absorbed, and on sinuses, not kept discharging by dead sequestra, there is an initial marked increase of discharge followed by rapid healing with supple non-keloidal scars. The evolution of tuberculous abscesses is often checked. In short, healing is hastened. The psychological effect is marked: happiness, vivacity, joy of life, is apparent.

Russel also advocated the drinking of large quantities of sea water, but as to the value of this procedure I hesitate, at the moment, to express an opinion.

RADIATION THERAPY OF TONGUE CARCINOMA *

BY

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The tongue is one of the commonest sites in males in which carcinoma occurs, representing 8 per cent. of cases according to Souttar.¹ It appears to be much commoner in males in Great Britain, but it is interesting to note that in the Philippine Islands Fernandez² reports that of twenty-one patients treated fourteen were females. It is a site where extensive loss of tissue produces a most distressing mutilation, and therefore one where it is of paramount importance to conserve as much of the normal tissue as may be possible. It is in this site, as in intra-oral carcinoma generally, that it is possible to speak as does Birkett³ of a revolution in treatment having been brought about by radiotherapy.

Radiotherapy, like ablation surgery, is a purely local method of removal of malignant tissue. We have very little knowledge of how this removal is brought about, but it depends on a differential destructive action which is the greater the more undifferentiated the tissue and the more frequent the mitosis.⁴ It would thus appear that the future control of malignant disease by radiation depends in part on the discovery of means of accentuating this differential action and in part on the earlier commencement of treatment. But so far as the carcinoma in the tongue remains a local disease, and, in particular, before it has extended from its original site to the regional glands, it is eminently curable if sufficiently

radiated. This radiation can be brought about without any ultimate loss of tissue other than that occasioned by the removal of so much, and no more, of the tongue as is carcinomatous.

The Normal Tongue

From the physiological point of view the tongue is concerned with speech, and also partly with the sense of taste. It is uncommon for taste to be seriously affected, and the mobility of the tongue and the degree to which it remains intact influence the extent to which normal speech remains possible. Radiation, however, markedly affects among normal tissues the salivary glands, and hence it is that dryness of the mouth is usual in patients treated by radiation for carcinoma of the tongue. But recovery in some degree of the secretory glands and habituation in part lead, as time goes on, to an amelioration in this symptom.

Anatomically, the tongue consists of two longitudinal muscular masses. Joined medially by a fibrous layer, they are covered on their free aspect by squamous epithelium. The anterior two-thirds of the tongue lies in the mouth, and the posterior third forms the anterior wall of the pharynx. The blood supply is derived from the lingual arteries. The lymphatic drainage of the anterior part of the tongue is to the submental glands and the anterior cervical glands. From the lateral part drainage is to the submaxillary group and to the upper cervical glands. At the root of the tongue median vessels pass through the muscles to end in the submaxillary groups.

The Histological Picture

Histologically, the growth from the mucous membrane is a squamous-celled carcinoma showing differentiation to a greater or lesser degree. In a recent series of seventeen biopsies of my cases, five were reported as squamous-celled carcinoma without amplification. Of the remaining twelve, one showed moderate differentiation, whilst in eleven the growth was well differentiated. None of these, however, had originated in the posterior third of the tongue, where growths of very anaplastic type may occur.

In general, the less differentiated the growth the greater the response to radiation. But this apparent advantage is more than offset by the increased likelihood of early dissemination. When, however, it is a matter of judging the course an individual case is likely to follow, the histological picture is not always a sure guide to the response that can be expected. Indeed, Martin⁵ thinks grading is of little value except as regards the probability of early metastases. The view formerly held by many that biopsy increased the probability of metastasis does not obtain to the same extent to-day. The absolute amount of tissue excised is not very large, and the trauma consequently slight, but to be on the safe side I prefer to use a small snare with a diathermic current of very high periodicity. Little distress is caused the patient, and the tissues are instantly sealed. With the very high frequency the depth of tissue coagulated is small, and hence small portions removed at the growing edge enable a sufficiently large section to be made to permit study of the growth.

It is preferable to put the mouth in good condition before implantation of radioactive sources, and, in particular, to remove septic stumps or dead teeth and to treat those teeth that are carious. But the advantages are not all on the side of unduly extensive teeth extraction, nor can it be said that no risk exists of the implantation of cancer cells in a socket whence recently a tooth has been extracted. Some patients, too, may fail to see the connexion between removal of highly valued teeth and their tongue ulcer, and so refuse extraction. In such cases I have not observed any untoward result from

* Read in opening a discussion in the Section of Radiology and Therapeutics at the Annual Meeting of the British Medical Association, Melbourne, 1935.