THESIS
for the degree of Doctor of Medicine
Submitted by

Thomas Still Bishop
M.B. o Ch. Edinburgh 1871
of
4 South Parade Bedford Park
Chorwick
On some cases treated by Mr. Talisman, Sheffield, boot Air Bath, with remarks on the Therapeutic action and uses of the apparatus.

In October, 1874, during my term of office as Senior Surgeon to the Royal Post-Marshal Hospital, Mr. Talisman constantly placed at the disposal of the Hospital authorities, for one month, one of his cylinders for the administration of superheated coal air locally, at temperature not hitherto attained by other means.

I propose to give a short description of the apparatus, a report of the cases, whose treatment by this system, I personally supervised, intended, and some remarks based on my own observations of the action, effects, and usefulness of this means of treatment.
The Hot Air Bath.
The apparatus consists of a large copper cylinder, of sufficient size to admit the whole lower extremity of an adult. One end of this cylinder is closed by a readily opened metal door, which is often utilized, during the treatment, as a means of keeping the heated air dry. The other end is open, and is repleted with a circular fringe of Rubbe sheeting, which encloses the limb placed in the bath and is firmly bandaged to it. By this means, the limb is practically sealed up in a closed cavity, the air of which is raised by external heat to great temperatures, being kept quite dry in the mean line by the ingenious method of ventilation employed.
The limb, while in the bath, rests on a hammock-like arrangement
of asbestos cushions, and cannot run any risk of contact with the heated metal cylinder.

The heat is applied externally by a system of Bunsen gas burners, and can be worked by making connection with an ordinary gas bracket.

A long thermometer, the bulb of which extends down into the centre of the cylinder, on a level with the limb under treatment, while its index projects outside the cylinder, so as to be always under observation without disturbing anything, completes the working part of the apparatus.

The method we employed for all the cases treated was that advised by Mr. Talleman, namely that before placing the limb in the bath for treatment, the temperature should be raised to about 160° F., and then after the
limb had been adjusted in position for the heat was applied until the thermometer recorded from 250°F to 300°F. The duration of the treatment in all cases was from sixty to forty minutes. The patient was seated in a comfortable chair, and warmly enveloped in wraps and blankets.

The Cases.
we applied the hot-air treatment in case of both surgical and medical characters, and I will proceed to give details in the first place of the Surgical Cases. The most striking of these were four in number:

1) A case of rigidity and stiffness of finger joints after the treatment of a Colles' fracture.

(2) A similar condition after treatment of a fracture of both bones of the forearm.
Case 1

E.B., female, age 31.

Suffering from rigidity and stiffness of the fingers of the right hand after treatment of Colles' fracture.

The fracture occurred nine weeks before the hot air bath treatment. She was put up with an anterior plaster splint leaving the fingers free in the usual manner. The rigidity was caused by the failure of the patient to attend hospital regularly for the application of passive movements.
On examination the fracture was found to be well united, and all the wrist movements were fairly free. The fingers were all semiflexed and the patient could not extend them herself at all, while attempt at forcible extension caused her very severe pain.

1st Bath. The arm was placed in the cylinder at 150°F and the temperature raised to 250°F and kept at that elevation for a period of forty minutes. On removal the skin was of a vivid red color and free from perspiration. The fingers could now be extended almost to the full without causing her much pain. Her hand was bandaged to a straight splint with the fingers extended as far as possible during the ensuing week.
hot air bath was repeated a three occasions with one day interval in between each bath. On all occasions the duration of treatment was about thirty minutes and the temperature attained varied from 240°F to 265°F. Her condition improved noticeably after each bath. At the end of a course of treatment of four baths the patient could quite freely extend and flex the fingers herself and without pain. She was able to resume her occupation of needle work without inconvenience.

Case II

S. W. boy, age 12 years. Suffered from stiff fingers after fracture of the forearm three months previously. The fracture had been treated in a straight splint for six
weeks, amounting to delayed bone union. The fingers were stiff and rigid in the extended position, and attempts to flex them caused him severe pain.

1st Bath: Bath for 40 minutes. Temperature of 265°F attained. The fingers showed marked improvement—allowed of some flexion without pain.

2nd Bath: Next day. Duration 30 minutes. Temperature 240°F. All the fingers could now be fully flexed and extended except the little and ring fingers.

3rd Bath: Duration 30 minutes. Temp. 250°F. All the fingers could be fully flexed and extended after this bath and without pain.

A fortnight later, the lad was seen again by me, and his hand was then perfectly well, with no impairment of movement.
Case III

S.C. Female age 50.

This patient fell downstairs six weeks ago and sustained a severe fracture of the right wrist. The medical attendant treated the case on a straight splint for six weeks, and afterwards advised her to go to the hospital to have the adhesions which had formed broken down under an anesthetic.

Her wrist and fingers were perfectly stiff in the extended position, and attempts at passive movement caused her great pain. She could not move any of her fingers but could oppose the thumb to the base of the index finger.

1st Bath Duration 40 minutes

Temperature 94.0°F

After fifteen minutes she volunteered the statement that she could move her index finger right-\-ward on withdrawing the hand from the
back, it was found that all her fingers could be moved slightly without pain, and that she herself could now touch the tip of her middle finger with the thumb. Although before the bath she complained of great pain on forcible attempts to flex the wrist, after the bath it was partially flexed without using much force and several adhesions were heard to give way with an audible snap. The patient herself feeling but little pain.

2nd Bath Duration 40 minutes

Temperature 90°F.

After the treatment at this high temperature, the movement was much increased. She could now herself touch the tips of all her fingers with the thumb. Some more joint adhesions were then broken down with but little pain.
3rd Bath. Two days later. Duration 30 minutes. Temperature 280°F.

After the bath, the range of movement of both wrist and fingers was very satisfactory. She could now, of her own accord, flex the fingers and double her fist, and move the wrist joint freely.

She was seen again by me in a fortnight and had good movement of wrist and fingers in all normal directions. She was greatly pleased at the result of the treatment, as she had been dreading the administration of an anaesthetic. She was now performing her household duties with no pain or difficulty.
Case IV

J.L., age 40, was a labouring man with a history of chronic synovitis of the knee joint for and two years, resulting from injury received by a fall before the hot-air bath treatment was commenced. Other methods had been resorted to for several months without any satisfactory results. Prolonged rest had not relieved the pain he continually suffered or reduced the swelling in any degree. The knee was considerably swollen, and of a puffy appearance. It was always kept partially flexed. The range of movement was very slight indeed and movement always caused great pain. Synovial disease had clearly made great progress and
The bones of the joint were undoubtedly affected in addition to the synovial membrane. The word 'bathing' under, whose charge the man was, was most anxious to improve the general condition of the man's health by food, food, and rest, in order that he might be in a favourable condition to undergo an excision of the knee joint. Though at rest in the hospital for several months, he had made but little improvement, owing largely to his being continually in pain and unable to sleep. As he was an inmate of the hospital, the hot-foot treatment was continued for the whole of the month during which the apparatus was at our disposal five thousand times in all, and
at the conclusion of the treatment
the circumference of the limb
taken at three points ie above
across and below the patella
had diminished at each point
by half an inch. The range
of movement was also slightly
increased. His pain however
was undoubtedly most markedly
relieved, and as he was now
able to get natural rest and
sleep, he certainly improved
considerably in general health
and gained seven pounds in
weight during the month of

his knee joint was shortly
afterwards excised by Dr.
Wood Jones, with very good
results. He had extensive
disease of both bones and synovial
membrane, but when seen by
me last, some twelve months after
operation, he could walk well and had a
good useful limb.
Medical Case:
I now pass to the consideration of two medical cases in which the hot air treatment was tested with success. The first case was a very advanced case of Rheumatoid Arthritis. The second a case of Chronic Rheumatism mainly involving the wrist joint.

Case 1
Miss H., age 22 years, had suffered from Rheumatoid Arthritis for a number of years, and was a complete edeple. Her knees and elbows were quite stiff and rigid, and she had considerable deformity of both hands, but especially of the left which was distorted and useless. The fingers being all stiffened and rigid, while any attempt at movement gave rise to severe pain.
This patient was of an extremely hysterical temperament and experienced some difficulty in inducing her to undergo the first bath treatment. The second one she took readily enough.

Unfortunately from private reasons this patient was not able to undergo a course of treatment of any duration but the results of two applications of the bath were most encouraging and she expressed herself much relieved.

The fingers became more moveable and less painful. The little and ring fingers which before treatment were stiff and rigid, became fairly pliable and could be almost straightened without causing pain.

She undoubtedly experienced great relief from pain in all the affected joints.
Case II

I.C. age 24. A carpenter had been recently invalided from the Royal Engineers owing to Chronic Arthritis.

He had not been able to work for some months owing to pain, swelling, and stiffness of the right wrist joint.

The joint showed very considerable thickening around it. The range of movement was limited and the grasp of the hand was feeble. Any attempt at forcibly increasing the range of movement of the joint caused him great pain and he complained of frequent pains in his and other joints even when at rest.

18th Bath

Duration 40 minutes.

Temperature 94°F.

After his right hand and arm had been twenty minutes in
The cylinder, he stated that he could move his wrist joint himself without pain.

2nd Bath. Five days later.
Duration 40 minutes.
Temperature 240°F.

He stated that since the last bath he had suffered for less pain. His grasp was certainly stronger and the range of movement increased, while the pain of attending on forcible movement seemed for less.

The thickening around the joint was proved by careful measurement to be slightly diminished.

3rd Bath. Two days later.
Duration 40 minutes.
Temperature 260°F.

The thickening around the joint was now measured and he told me that he had...
Since the last bath, suffered very little pain. He could now grasp me firmly by the hand.

1st bath: Duration 45 minutes.
Temperature 260°F.

The thickening around the joint & the pain have both almost gone. His condition was in every respect much improved.

After the lapse of a week I again saw him and was well satisfied by his condition. All the thickening around the joint was absorbed, and the range of wrist movement and strength of grasp were both good. He could feel and extend his wrist freely and without pain, and announced his intention of returning to his work as a carpenter as soon as he could find employment.
Action of the Hot Air Bath.

I must now pass on to a short description of the effects of these hot air baths both locally and constitutionally as noted by myself during the month in which the Tallman Cylinder was under my charge and I shall endeavor to show in what way these effects may be expected to exert a beneficial influence upon the symptoms and progress of diseased conditions.

In the first place as regards the constitutional effects from the system generally I can state that in no one case out of a considerable number submitted to treatment did any individual complain of any sensation of faintness or weakness during the administration.
In the most part the patients spoke of a sensation of comfort from the hot air and if occasionally the free perspiration from the part under treatment caused the air in the cylinder to become moist and give rise to sensations akin to scalding a momentary opening of the hinged door at the cylinder and relieved this feeling at once.

Most of the subjects treated spoke of a slight feeling of fatigue or languor after the baths, and after lasting to the following day, it usually case did not we apply the bath two days in succession.

It occurred to us to make some observations on the effect of the treatment upon the general body temperature during the bath administrations.
work. The result was that in all cases the temperature, taken in the mouth, before and during the treatment, showed a rise of from one to two degrees, while exposed to the local action of the superheated air. The pulse rate also was accelerated in most cases by from eight to ten beats in the minute.

As regards the local action upon the limb actually placed in the cylinder, the most obvious changes produced are of course, the greatly increased flow of blood in the skin and subcutaneous tissues, and the very profuse diaphoresis. This marked local sweating is accompanied by a paralysis of the skin of the body generally, and a considerable
general diaphoresis, not however so copious as that of the post under immediate treatment.

As regards the main effect on the systems detailed above it will be seen that they correspond closely with those usually produced by the ordinary Turkish Bath but with this important difference. The range of temperature that can be locally applied without discomfort by H. Tallman's cylinder is far in excess of that which can be usually tolerated by individuals in a Turkish Bath, where the heated air has to be refired.

In our cases we several times reached a local temperature of nearly 300° F. without the patient feeling any discomfort.
or injurious effect, and this high range of temperature can be readily prolonged for an hour or more safely. In this way far more marked local effects can be produced than are possible with the ordinary Turkish Bath, or any other hot-air appliance with which I am familiar.

In the second place, in considering the principal influences of the Superheated Air Bath on various pathological processes and conditions, I will mention the three which were to me most obvious and striking:

(i) The rapid elimination of morbid products
(ii) The effective relief of pain
(iii) The reduction of inflammatory action or its products.
These three points will allude to briefly in succession:

1. Rapid Elimination of Morbid Products

In respect to this, the very free and copious local perspiration, often prolonged for a period of from a half to one hour, and capable of repetition several times in one week, appears to me to favour, in a stocking manner, the local elimination of the morbid products of disease such as, for example, those of gout and rheumatism.

In the cases treated by myself of Rheumatoid Arthritis, the condition was a very advanced and old standing one, and the patient who had been for years the subject of all manner of treatment without
relief being experienced, or the progress of the condition arrested. Certainly shared very marked improvement in a strikingly short time, and I have seen no other case of Rheumatoid Arthritis derive as much benefit from any of the usually employed methods of treatment even when persevered with for some time.

The improvement in the case was, I venture to think, probably due to the elimination of morbid products locally as well as to the rapid absorption of the small amount of fluid effused in some of the affected joints, and to the reduction of the chronic hypoaemia swelling and thickening of the affected joint capsules and ligaments. I need not say that this treatment could not have any effect
beneficial or otherwise, or anatomical alterations of bone structure or an eroded inter-articular cartilage which have been replaced by the usual ivory-like substance of this disease. Existing rheumatic and periartitis wounds in my opinion be undoubtedly relieved by this treatment.

As regards the question of relief of symptoms in acute gout, it is not possible that the urine of soda which Dr. Parrod describe as being in the solution in the blood during the process may be eliminated pretty effectively by the skin pores at their periods of functional activity during the treatment.

I regretted much my inability to test the efficacy of the hot
air treatment in other cases of Rheumatic Arthritis, but none were at the time available.

I have however, received since the report of several cases from Mr. Talisman treated by Dr. Hepburn of Corkhill and Mr. Hepburn to one of the North West London Hospital, cases which show beneficial results as encouraging or even more so. Here one of the cases under my personal observation.

ii Relief of Pain.

This was the most striking feature perhaps of all the cases we treated.

These cases had mostly pain of a chronic character, occasioned by the muscle defects and anatomical change of conditions.
Such as are produced by chronic rheumatism, rheumatic arthritis and by chronic knee joint disease, or after injuries such as fractures and sprains.

I was so struck by the relief of pain experienced that I was very anxious to have an opportunity of testing the value of the treatment as an anaodyne in various more acute inflammatory conditions than the above. I mean such cases as those of acute gout or even rheumatism in selected cases such as sciatica, lumbago, acute rupture of joints from injury or strain and such conditions as cellulitis of the hand resulting from poisoned wounds and attended by lymphangitis.
I have since, during the earlier part of 1876, through the kindness of the Tallerman, had opportunities of noting the effects of the treatment in one of the acute conditions named above, i.e., in acute gout. At the Institute was established in Welbeck Street.

In this case the anaesthetic effect of the bath was very striking, and I have since learnt that the sufferer experienced complete immunity from pain for eight hours after the first bath, and that the whole condition was cured by the application of five baths in the space of ten days. I was not however able to personally observe the progress of the case after the first bath.
Reduction of Inflammation

The absorption of the chronic inflammatory thickenings & products are in my opinion greatly helped and accelerated by the hot air bath treatment. In all my cases of old standing sprains & fractures, with swelling & stiffness resulting, were reduced in size even after the first bath. Moreover the inflammatory adhesions of joints and effuses attending an infirmary, which have not yet had time to become converted into firm fibrous bands, through slow cellular changes, are in my opinion rendered so much softer & more yielding in character by one or two applications of the bath, that slight can be readily broken down by a little manipulation.
after the treatment and that too with only a trifling amount of pain.

I do not consider it likely that even prolonged or frequent administrations of hot baths would do anything to alter the state of the fibrous adhesions or to allow of their being broken except in the customary manner under an anaesthetic. This having been done, we doubt the usual after pain and soreness attending the procedure would in doubt be alleviated at once by a hot air bath, and the tendency to recurrence of acute inflammatory symptoms much diminished.

I find a similar opinion in a report of a clinical lecture delivered at St. Bartholomew's Hospital by Sir Willett in
1894, in which he graphically describe his first experience with Mr Tallman's apparatus.

No doubt the active hyperemia produced by the high temperature assisted by the epidermis extraction from suppurate glands suffice to explain this action of increased absorption readily enough.

It was a matter of regret to me that I had no means of testing the efficiency of this form of treatment during the month it was at my disposal. Upon a case of really acute inflammation, but I have no doubt that in suitable cases, the symptoms of pain, heat, swelling and effusion would all be successfully relieved by these hot air baths, and the duration of the inflammatory process curtailed.
My experience with Mr. Talman's invention was unfortunately limited both in time and in the number of available cases, and I was sorry to state it was not possible to continue observations which in some directions seemed to hold out good promise of success. Mr. Talman however has since placed his cylinders at the disposal of many of our public institutions, amongst others, being the Royal Edinburgh Royal Infirmary, The North West London Hospital, St. Bartholomew's Hospital, where Dr. Hulme, and Mr. Hill and Mr. Hill and Mr. Hill made many observations, and who in May 1807 Mr. Hilllett delivered a clinical lecture on the Therapeutic actions and uses of
The treatment.

He Wahnam in his recent work on "The Deformities of the Human Foot and their Treatment" makes the following remarks.

"Treatment of the third or rigid degree of flat foot"

Since writing the treatment of flat foot, we have, instead of giving an anesthetic, placed the rigid foot in the Tallman-Snell hot-ammonia bath, in order to produce relaxation of the adaptively contracted muscles and ligaments.

In several cases in which the foot was held rigidly abducted with the bones displaced in the way characteristic of the severe degree and in which more over the bones could not be forced back by manipulation with the unaided hands, we found that after the foot had been soaked three quarters of an hour in the bath at a temperature of about 300°F...
It came out quite supple, so that instant any force, the bones could be replaced and the arch restored. The foot was then in some instances put in Plaster of Paris in the adducted and plantar-flexed position for the usual time, and in other instances a boot or booting was ordered and exercises begun.

The Farnell of January 12th 1895 also describes the apparatus and its uses and adds some remarks which are in substantial agreement with much that I have written and recorded here.

In conclusion I may point out to predict a wide sphere of usefulness for this method of treatment in certain cases which I have endeavored to outline above. I wish to express my obligation to Dr. Tallerman for the use of his apparatus for permission to observe and note cases under treatment at the Welbeck Institute during the past few months.