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*Pott's Disease*

*Shaffer*



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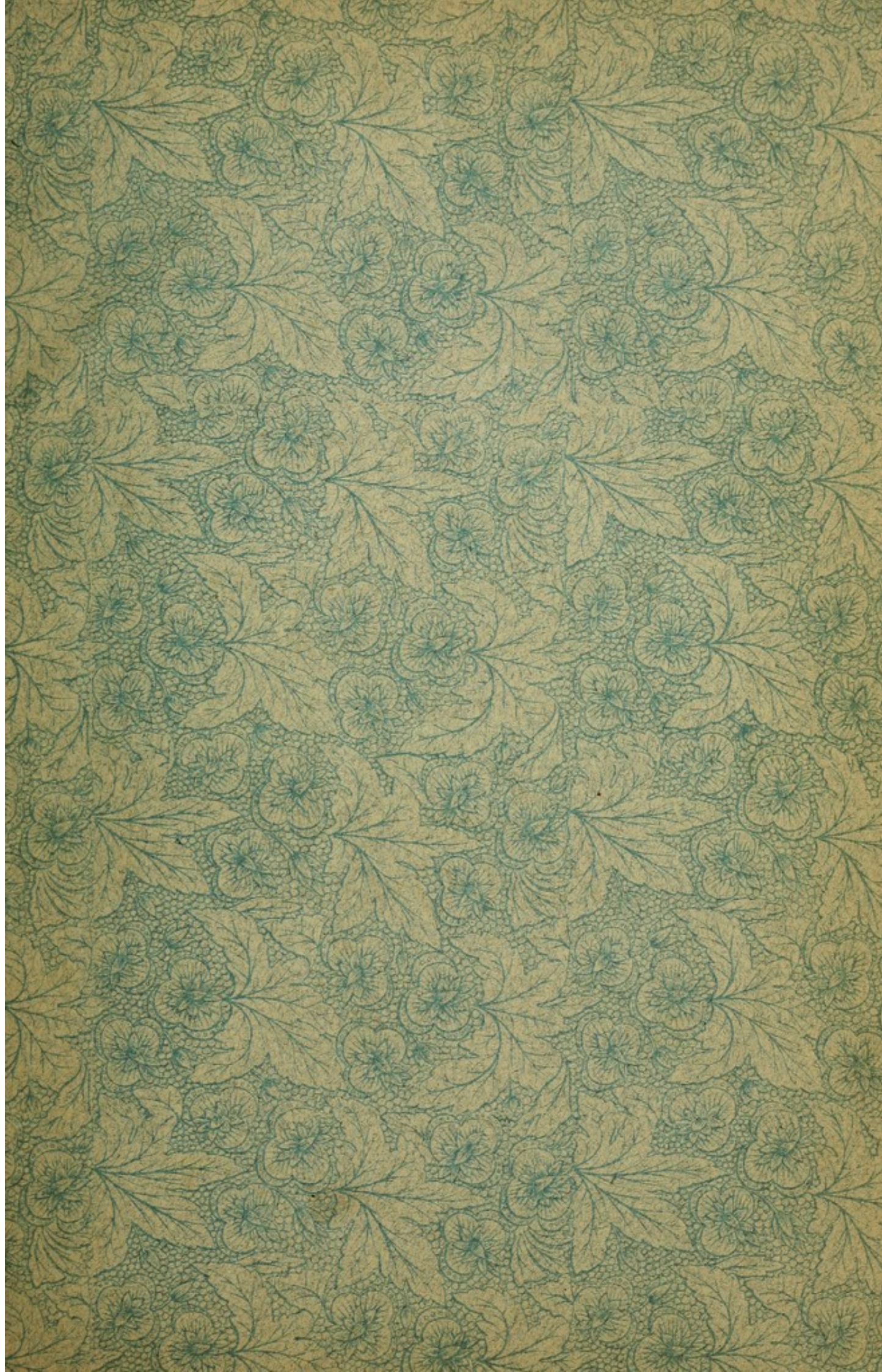
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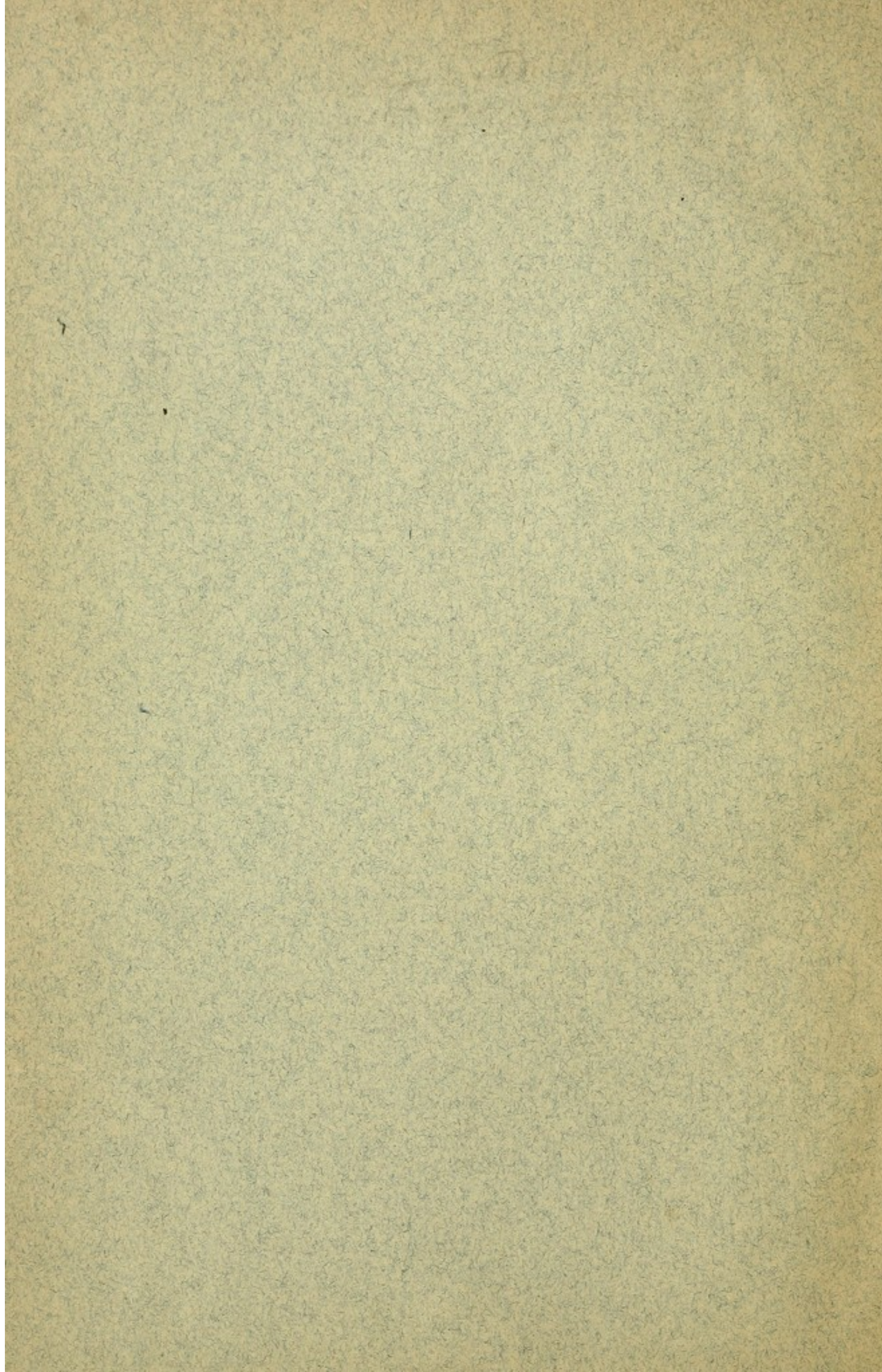
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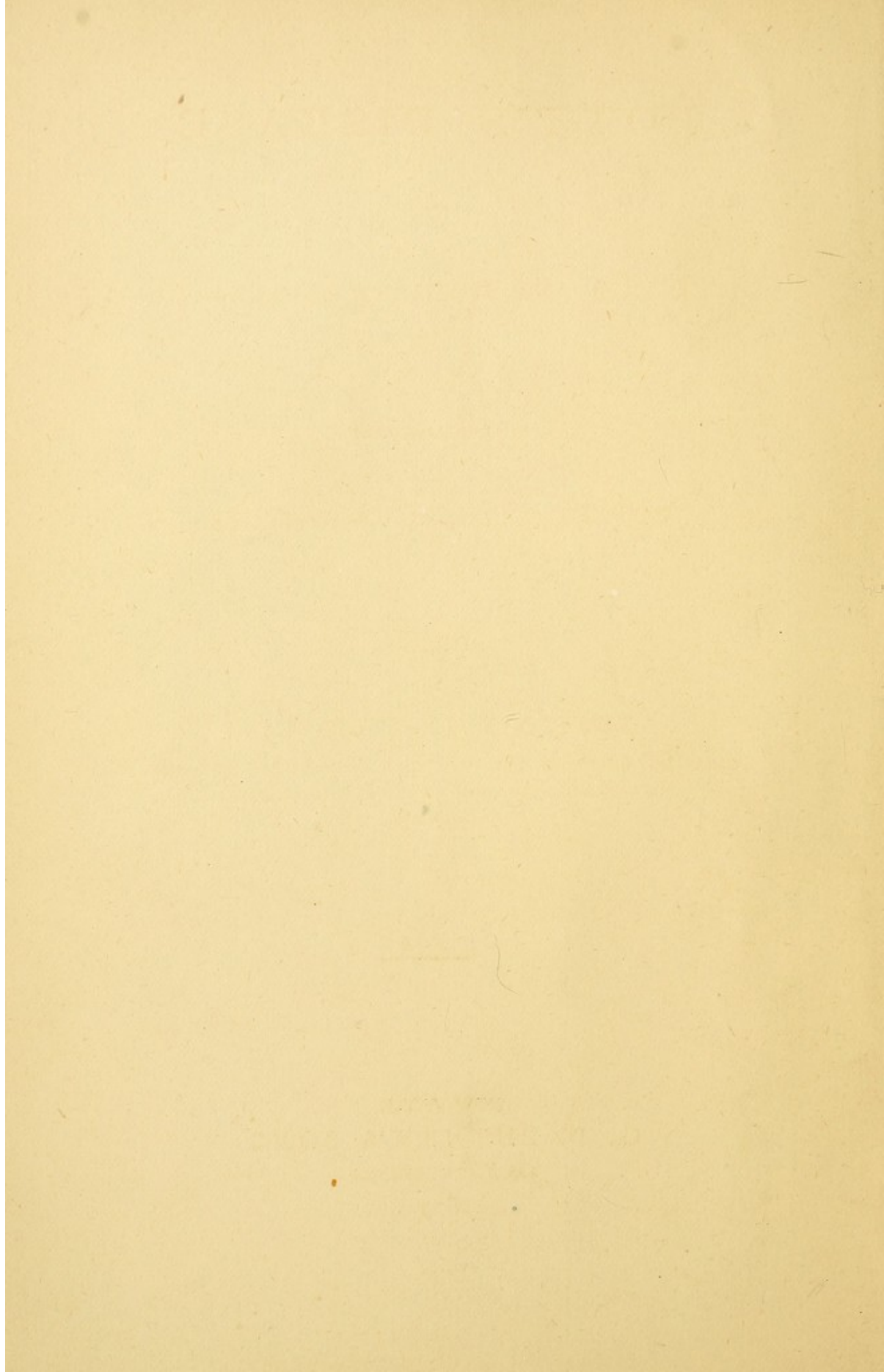




From

Newton M. Shaffer,







# POTT'S DISEASE

ITS

PATHOLOGY AND MECHANICAL TREATMENT

WITH REMARKS ON

ROTARY LATERAL CURVATURE

BY

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## PREFACE.

The substance of the following pages was read before the Medical Society of the County of New York, on June 24th, 1878. It was my intention to revise the essay presented on that occasion, for publication in *The Hospital Gazette*, early in the Autumn. Various matters interfered with this design, and it was not until February of the present year that the subject seriously engaged my attention.

About March 1st, Chapter I was placed in the hands of the Editors of the *Gazette*. It alone nearly equalled the original essay in volume. Chapter II was finished before the first had been put in type, and it was then thought by a few kindly critics, that the paper, as revised, was worthy of publication in its present form. The Editors kindly released me from my engagement, and the essay is now submitted to the profession.

That portion beginning with the third paragraph on page 38, and ending on page 48, is printed, with the exception of the foot-notes, as read before the Society. I am in-

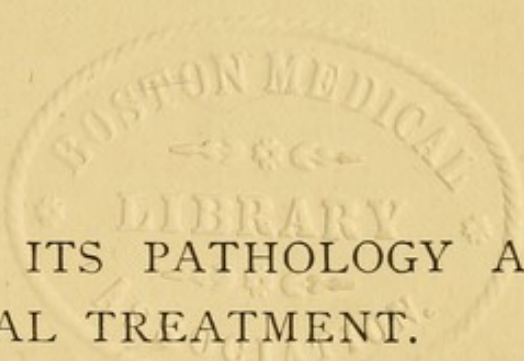


fluenced to call attention to this fact, and to leave this part of the paper unchanged, (though recent experience would permit me to speak more forcibly upon some important points there considered), because, I am convinced, I was the first to call attention to the fallacies of the "plaster jacket treatment" of Pott's disease; and still further, because some of the same points were mentioned by Dr. J. A. Wyeth in his paper on *The Treatment of Pott's Disease by Continuous Extension*, read before the Medical Society of the County of New York, on January 27th, 1879, and published in *The Hospital Gazette* in its next issue thereafter. Dr. F. H. Hamilton also, in discussing Dr. Wyeth's paper, incidentally demonstrated some facts to which I had especially called attention last June. I may also mention that some of these points have been recently discussed abroad; all of which tends to prove that my remarks before the Society were in no way premature.

An imperfect report of my paper, including an incomplete synopsis of my remarks on the defects of the "jacket" may be found in *The Medical Record* of Aug. 31st, 1878.

NEW YORK, April, 1879.



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POTT'S DISEASE: ITS PATHOLOGY AND  
MECHANICAL TREATMENT.

WITH REMARKS ON  
ROTARY LATERAL CURVATURE.

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CHAPTER I.

PATHOLOGY.

THE opportunities for making post-mortem examinations, with a view to ascertain the pathological condition of the vertebral column in the earliest stage of Pott's disease—that is, before deformity occurs—are certainly very rare. If the lesion presented at this period, an *acute* stage, during which the patient might die, our pathological opportunities would be increased, and many points still in dispute regarding its etiology would be definitely settled. But I have never seen, nor obtained the history of, an idiopathic, *acute* spondylitis. That which has ordinarily been described to me as such, I am convinced, has been nothing more than an exacerbation of an insidiously progressive, but semi-latent chronic state. And many of the so-called acute and sub-acute attacks which ultimate in a completely disintegrated joint, are generally found as part of the history of every progressive, chronic, osseous lesion of the



articulations. On the other hand, the frequent occurrence of an idiopathic, acute inflammation of some of the structures entering into the formation of the larger articulations, and especially the synovial membrane and fibrous capsule, has suggested to many surgeons that this acute condition may pass by gradual stages into a chronic one. But no one has, so far as I am aware, attempted to trace a chronic spondylitis to a definite, acute, non-traumatic origin. In every sense this disease may be considered a typically chronic one, from its very inception to its ultimate result. Indeed, the disease is so typically chronic, that it is always a difficult matter to decide in each case, as it presents for examination, at just what time the lesion began: nor is it always clear, especially in the latter stages of the chronic lesions of the spine, hip or knee, as to just what tissue was originally attacked.

If we question intelligent and observing persons who have carefully watched the patient, regarding the early development of the symptoms in a case of Pott's disease, we find, in many instances, that the child has shown an indifference to his ordinary amusements for an indefinite time, which preceded, however, the appearance of pain or deformity. This condition resembles the incipient stage of chronic osteitis affecting the larger articulations, and it points both in chronic epiphysitis of the larger bones of the extremities, and in chronic spondylitis, to a peculiar condition of the system, which, whether hereditary or acquired, places the patient in a state where a slight injury may act as an exciting cause. This peculiar tendency to develop chronic osteitis, either in the vertebral column or the larger epiphyses, upon slight provocation, accounts in great



measure, for the readiness with which parents and nurses assign a traumatic origin to the disease.\*

I have never had an opportunity to examine, post-mortem, the pathological condition of a vertebral column in the stage alluded to in the first paragraph of this paper, viz., before the appearance of deformity. Even if such examinations were on record, it would require accurate microscopic descriptions of many cases to establish facts regarding the changes which primarily occur, and their most frequent seat.

We have Barwell's conclusions † as to the condition of the joint ends in strumous children, which are, I believe, generally accepted as correct. In the absence, among the authors I have consulted, of other important facts bearing upon this point, and based upon actual and very early pathological exploration, I propose, with the aid I have derived from them and from my own experience, both pathological and clinical, to consider the lesion from these standpoints.

Pott's disease, or chronic spondylitis, as I have preferred to call it, may be divided into four stages.

The *first* (the one before alluded to) may be very ill-defined, and easily escape the notice of the careless observer. I saw a case recently, for example, where the mother was certain that the first symptom she noticed was "a pain in the back." This was "a few days ago." The appearance of the child

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\* Guersant (*Surgical Diseases of Children*, Duglison's Translation, 1873, page 107,) says, "An important observation we may make is, that traumatic arthritis, properly treated, rarely passes into a chronic condition, a fact which we have had many opportunities to verify, although often fearing to the contrary. The cure is assured if the patients are not predisposed to a scrofulous constitution."

† Barwell on Diseases of the Joints, American edition, page 227.



and the deformity did not indicate a disease of long duration, but closer questioning elicited the fact that a few months before the appearance of the pain in the back, he had had "malarial fever." An examination developed an abscess in the sheath of the psoas muscle, which, undoubtedly, was formed during the "malarial fever." A careful examination—without intimating its object to the person most familiar with the history of the patient—will very frequently develop early symptoms which are as insidious, as is the development, in many cases, of the more apparent signs of the disease. This stage may continue for many months, or it may exist for a few days only, and in some cases it is, apparently, absent. Its existence was first brought to my attention by voluntary statements on the part of those having charge of patients, and it may be stated as the result of my own experience in the matter that, in chronic spondylitis, the first symptoms noticed by intelligent people, in the majority of cases, are those which can only be described as occurring in the prodromal stage. I have found that this condition exists with great frequency, and is sufficiently well marked to warrant its introduction as one of the *stages* of the disease.

The *second* stage is that of pain. But this stage, like the first, is sometimes absent, for as Billroth remarks of chronic inflammation of the joints, so clinical experience demonstrates we may say of chronic spondylitis:—"there are cases where the bone is extensively destroyed without any pain."\* I have frequently seen cases where the kyphotic curve was the only evidence of a progressive, fungous, non-suppurative osteitis of

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\* Hackley's Billroth, page 482.



the vertebral bodies. Chronic osteitis of the hip joint also may go on to an actual shortening of the femur, with an entire absence of pain, so far as its *oral* expression is concerned. Pain, however, is present in the great majority of cases of chronic spondylitis, and it is generally accompanied, and not infrequently preceded, by a marked reflex spasm of some of the spinal muscles. This *pain*, which, in the earlier stages of the disease, is most frequently experienced at the periphery of the spinal nerves, probably arises from an irritation of these nerves as they pass through their foramina; but in many cases the inflammatory focus does not involve those parts which are immediately contiguous to the foramina, and are we prepared to say that in *all* cases the "gastralgia," so-called, arises from this cause and no other?

The reflex spasm of the muscles does not form the subject of any *voluntary* complaint on the part of the patient. As I first pointed out,\* this reflex muscular spasm in joint inflammation is due to an irritation, peculiar in its character, of the peripheral nerves which actually supply the diseased or inflamed structure. It is accompanied, however, by an apprehensive feeling which is very difficult to define, but which is certainly very distressing to the patient. This sensation, oftentimes merging into violent paroxysms of pain, is not limited to any particular region, and on account of the intimate relation existing between the minute nerve filaments terminating in the vertebræ, and the great nerve centres, evinces itself in many ways, involuntarily. This spasm, which in many cases

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\* Reflex Muscular Contraction and Atrophy in Chronic Joint Disease. *Archives of Clinical Surgery*, June 15th, 1877.



might be called tetanoid, is present night and day, and after many experiments in diseases of the larger joints, I have found that it will yield to profound anæsthesia only. Certain it is, that the causes which produce this reflex, tetanoid spasm leave upon the patient, after a comparatively short space of time, evidences of severe suffering—evidences which do not follow chronic lesions of the synovial membrane or cartilage.

The *third* stage is that of deformity, and is due to some loss of substance in one or more of the bodies of the vertebræ. Sometimes suppuration ensues rapidly, in others it occurs later, while, not rarely, a morbid process, which has been aptly termed *caries sicca* by German pathologists, occurs, which ultimates in a very pronounced deformity without any evidences whatever of pyogenetic action. When abscess occurs it forms the *fourth* stage. Much might be written regarding this stage of the disease, but the limits of this paper will not permit any extended remarks. I will merely say that the absence of suppuration or any of its symptoms, together with an apparently arrested deformity, not unfrequently serves as a mask to the inherent chronicity of the lesion. Nor does this apparently favorable condition by any means insure the arrest of the destructive inflammation, nor the really progressive kyphosis. There are indications by which the permanent arrest of the morbid action may be demonstrated. But they need not detain us here. The clinical fact to which I wish to invite attention, especially, is that if the symptoms one would naturally expect to find associated with this disease are *not* present, it does not afford positive evidence upon which to make a favorable prognosis. On the contrary, the absence of suppuration after the disease



has existed for many months, points, in many cases, and especially in the fungous caries, to an unfavorable prognosis in point of time. The nearer a chronic spondylitis approaches an acute disease in character the more favorable, and of course, the more quickly obtained, is the result. Again quoting Billroth, we may say of spinal caries, as of any other chronic joint lesion,—“a good nutritive condition is the most important point for a favorable prognosis, which would not be very greatly affected by an early and extensive suppuration.” An *early* suppuration, even if it be extensive, has, in my own experience, been indicative of a timely and favorable result. (See Case V.) In Pott's disease the formation of pus is, as a rule, marked by exacerbations of pain, by an evening rise of temperature, by a peculiar nocturnal cry, which I have named the osteitic, and sometimes—though it is very difficult to obtain this part of the history in children—by slight chilly sensations in the early stage. The rise in temperature, like that which occurs in the suppurative stage of chronic osteitis of the hip or other joints, does not usually exceed  $102^{\circ}$ – $103^{\circ}$  in the evening, (I have seen it as high as  $105^{\circ}$ ) and in the morning the mercury drops back to  $99^{\circ}$ – $100^{\circ}$ . If the disease occur in that region of the spine which affords attachment for the *psoas magnus*, this muscle, as well as the *iliacus internus*, may become the seat of reflex spasm. Whenever, in chronic spondylitis, the *psoas* resists when placed upon the stretch, it is well to explore, by palpation, the pelvic fossæ and the course of the contracted muscle. There are some patients who will, involuntarily, make the abdominal muscles tense when this examination is attempted. Under these circumstances, I administer ether,



after the plan of Dr. Packard,\* of Philadelphia, and, during the primary stage of anæsthesia, which in several of my cases has been brought about in less than sixty seconds, I have been enabled to examine for thirty or forty seconds, without meeting any muscular resistance, the abdomen and pelvic fossæ. In this way I have been enabled to recognize the existence of an abscess at my first examination, and before any external signs whatever of it existed. As it is always important to know whether pus exists or not in these cases, I can confidently recommend this plan, which I first tested in St. Luke's Hospital, with Dr. Andrew H. Smith, in a case where considerable difficulty in making the pelvic and abdominal examinations led to the adoption of this simple, useful procedure.

I have attempted to make an intelligent pathological division of the various phenomena of Pott's disease. I cannot avoid recognizing that it is impossible in the present state of our pathological knowledge to do much more than make an arbitrary classification of the disease into different stages.

In a typical case, we find the stages I have attempted to describe clearly marked. In many cases we find them all present at the first examination : viz., malaise, pain, deformity and suppuration, with no intelligent history as to their sequence. Again, I have seen several cases where profuse suppuration preceded the appearance of deformity, others where paraplegia occurred before the curvature, and many cases where pain, or rather the *oral* expression of pain, was wholly absent, though the kyphosis was marked. I was tempted to make a fifth, or exceptional stage, namely, paraplegia ; but this condition is so clearly symptomatic,

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\* *Am. Jour. Med. Sciences*, July, 1877.



and, in reality, occurs so rarely under intelligent treatment, that I have classed it among the symptoms of any of the stages. The irregularity, however, with which the various prominent phenomena appear, has also been accompanied by other peculiarities which have added much to the clinical and probable pathological aspects of the subject. They have, in the main, served to strengthen, rather than weaken the division I have made.

As before stated, chronic spondylitis may be divided into two classes, viz., that in which suppuration is a comparatively early symptom, and the non-suppurative, or that in which *caries sicca* occurs. As Billroth forcibly expresses it, "The fungous articular inflammations are often accompanied by *caries sicca*; the affection may go on for years without the formation of abscess, especially in adults otherwise healthy; there may be extensive destruction in the cartilage and bones, with the consecutive dislocations already mentioned under *caries*, without a drop of pus." \* This extremely interesting condition I have seen very often, clinically, both in the spine and larger joints, and on several occasions after amputation and excision of the larger joints. For reasons which I shall state hereafter, I think it very rare that this condition of *caries sicca* is seen in the vertebral column after death. Billroth's description of the pathological appearances of this fungous *caries* is brief and practical. I will condense and quote it here: "If you examine the granulations in the joint and bone, you will find them firmer than usual, and occasionally of cartilaginous consistence, like granulations about to atrophy or cicatrize. Indeed, they do partly atrophy, but the proliferation goes on again, and the bone is destroyed: the

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\* Op. cit., p. 478.



process is analagous to cirrhosis ; the more luxurious the proliferation of the granulations, the more extensive the destruction." \*

In the vertebral column, the initial lesion may be, among other conditions, an *osteitis interna fungosa seu granulosa* ; an *osteitis interna caseosa* ; a *caries superficialis*, following a *periostitis*, or a *caries interna necrotica*. These descriptive titles, taken from different pathologists, express some of the conditions that may be met with clinically, and pathological investigations prove that the original lesion may be termed, in all but the exceptional cases, a chronic osteitis, to which we may add the various qualifying terms to express the exact pathological condition. The German authors use many names to describe the several conditions found in chronic articular lesions, and while subdivisions of the two general classes—fungoid and suppurative, (the latter frequently taking the atonic form) may be made with advantage pathologically, the terms *caries* and *chronic osteitis* are used synonymously by many modern writers, the former signification of caries, "ulceration accompanied by suppuration, open ulcers of the bone," being, to a great extent, ignored. It is thus that we speak of a fungous osteitis, where the inflammatory neoplasia proliferate and then contract and cicatrize, but which may degenerate under certain circumstances into an ichorous, flocculent discharge, which marks the atonic form of caries. A very practical remark of Billroth will bear repeating here : "Pathological anatomists who see caries in the dissecting room only, seldom know the ganulo-fungous variety well, or regard it the less frequent one. But

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\* Op. Cit., page 476.



any one who has frequent opportunities of examining pieces of carious bone during life, especially the resected joints of children, where the process is in a state of active development, will form a very different opinion." † The general failure of the vital force which precedes death, produces an effect upon these fungous granulations which results in a rapid breaking down of the neoplastic proliferations of the dry caries—the result is the formation of a degenerate pus, which is discovered at the autopsy. Hence it is that some observers have concluded that "all spinal caries is suppurative."

In a former paragraph I used the phrase, "comparatively early suppuration." I mean by this, when speaking of chronic spondylitis, a suppuration which progresses rapidly enough to appear as a "cold abscess" within, we will say, a year from the first, specific expression of the disease. As a rule, and depending on the site of the initial lesion, the suppurative form of the disease is characterized by the early appearance of pain at the periphery of the irritated spinal nerve, and an abrupt curvature which is apt to result from the rapid loss of bone and fibrocartilage. Reflex muscular spasm is not so marked in the suppurative as it is in the fungous form—and suppuration, in spinal osteitis as in caries of the larger joints, seems to exert a modifying influence upon the reflex spasm. The peculiar deformity which results, in many cases, from the suppurative form of the lesion, has been for a long time known under the solecism, "Angular Curvature." In the majority of cases, in my own experience, but few vertebræ are involved in this active, suppurative process, though as the disease progresses

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† Billroth's Surg. Path., Sydenham Ed., Vol. II., page 158.



and involves other vertebræ, the abruptness of the projection may be lost. The caries sicca, on the other hand, more frequently involves a considerable number of the vertebræ primarily, and the resulting deformity partakes more of the character of a true curvature, sometimes, especially in the adult, like the excurvated spine of the old writers.

In the early history of the dry caries the pain partakes of an apprehensive character, which, however, may become acute under slight traumatic influence, and as in the granular caries of the large articulations, the intense muscular spasm shows the profound impression which the fungous proliferations make upon the nerve filaments distributed to the spongy and vascular osseous tissue. Another fact which I have noticed in connection with these two important conditions—the dry and humid forms of the disease—is that while no portion of the spinal column is exempt from either, the non-suppurative variety occurs more frequently in the dorsal region—more frequently indeed than in the cervical and lumbar regions combined.

The atonic variety of suppurative spondylitis occurs very frequently among strumous children, and is usually described as the typical, strumous Pott's disease. It is, as a rule, accompanied by several of the commonly accepted evidences of scrofula, while on the other hand, I have frequently remarked that the dry caries may exist to a very considerable extent, and progress to marked deformity and loss of osseous tissue, without any marked evidence of dyscrasia in the patient. I have a patient now in my ward at St. Luke's Hospital, whose health is apparently good. There are no evidences whatever of struma, unless we except the joint disease and a slightly tinged sclerotic,



and yet he has had a fungoid osteitis of the hip joint for two years. The thigh muscles are atrophied, the limb is shortened an inch, and the joint is practically immobilized by the most intense and persistent reflex muscular spasm. The analogue of this condition in the spine, I have seen very frequently, where all evidences of suppuration were wanting, and the excellent general condition of the patient gave delusive hopes that the kyphos was permanently arrested. This non-suppurative variety of spondylitis, however, is found more frequently, in proportion to the whole number of cases, among adults. It may, however, and following a failure of the general health, it frequently does, assume a suppurative phase. The transformation of the fungoid into the atonic form of the disease is ordinarily attended with urgent symptoms, and in the adult is followed, as a rule, by death. Septicæmia and amyloid degeneration are the most frequent causes of death in the suppurative variety, while tubercular meningitis has only too frequently, in my own experience, followed upon the dry caries, both in public and private practice.

Brodie first called attention to the fact that adults sometimes experience a non-suppurative form of spinal disease. The granular caries was apparently, not known as such to him, and as in many cases, he found a rheumatic history, this eminent writer considered the condition to be of rheumatic origin. In whatever light, however, we view the dry, granulo-fungoid osteitis of the vertebral bodies, clinical experience demonstrates that it is the most tedious disease, either in children or adults, that can affect the articulations: that it is the most difficult to control, and the typical rotary scoliosis alone excepted, the most insidiously progressive.



I have already referred to the reflex muscular spasm, which is not only an early symptom of chronic spondylitis, but also of chronic epiphysitis. This muscular spasm is a prominent symptom of the dry form of spondylitis and when once fairly developed, it is a pretty sure indication that the best efforts in the way of treatment, both constitutional and mechanical, will not suffice to prevent some increase in the spinal curvature. On the other hand, in the more favorable forms of suppurative spondylitis, where the pus approaches the laudable in character, this spasm is not so marked, as I have before stated, and the result, other things being favorable, should be good. Of the atonic variety I need only say that the ichorous, flocculent discharge tells its own story, and that too much should not be expected of an already overburdened constitution.

There are some forms of spinal deformity or curvature, the etiology of which, in the absence of pathological exploration, is quite obscure. I cannot stop here to mention all these conditions, or to attempt to classify them. I may simply say that they seem to have one symptom in common at some stage of their development, viz., a painless contraction or spasm of some of the spinal muscles. In rotary lateral curvature, for example, there is, seemingly, no direct evidence of muscular contraction in the *earliest* stage of the lesion, though I have found resistance to lateral flexion quite marked in many cases. If the intervertebral articulations were the perfect analogues of the larger joints, such conditions might correspond, in their incipient stage, to the chronic synovial inflammations of the latter, which, as I first pointed out,\* are not accompanied to any

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\* Loc. cit. and Seguin's American Clinical Lectures, Vol. III, No. VI.



great extent by a reflex muscular spasm, and which are also, for a physiological reason, practically painless. I have seen many cases of varied and great deformity of the spine, where the chief agency or factor in the production of the deformity was a painless, but very persistent muscular contraction, and where the apparent condition was, from an ultimate cause yet to be ascertained, an absolute motor paresis of some of the spinal muscles, followed by a shortening of the unbalanced antagonists. In many of these cases also, there are neural symptoms, or even the history of a severe lesion of one of the nerve centres. Such, for example, was the case of H. M., a boy of 14 years. This case was referred to me by Dr. T. M. Markoe, and was seen in consultation with Dr. B. F. Dexter, in November, 1877. In the fall of 1876, the patient, after severe mental exertion at school, had an attack of spinal meningitis, which greatly imperilled his life. He recovered, however, and became, instead of the strong boy he was formerly, a very delicate and effeminate lad. Soon a slight lordosis of the spinal column was noticed. This became slowly progressive, until at the time of the consultation, the anterior curvature of the spinal column was very marked,—resembling indeed the position of the spine in extreme opisthotonos. There was little or no muscular rigidity of the spinal muscles in the erect position. The abdominal muscles were tense; by supporting the abdomen in front, the spine could be gradually straightened, but this the patient could not accomplish unaided. There was no pain whatever after forcible tests. The lordosis disappeared almost completely when the patient assumed a prone position. The malposition was quite easily corrected with apparatus, but as the anterior curve disappeared



under treatment, a typical lateral curvature appeared, accompanied by rotation of the bodies and rigidity, to a considerable extent, in lateral flexion. This is the boy's condition at present, though the scoliosis is under control. There are other cases where, after an insidious prodromal stage, the symptoms partake more of an apparently sub-acute character. The latter stage is generally short, pain being more or less marked. This is followed by a painless reflex spasm of the muscles. The condition described occurs most frequently in the cervical region; or, at least, it is the best studied in the neck, and the muscular phenomena present some very curious and anomalous conditions: for example, a marked contraction of the right sterno-mastoid existing with rotation of the chin to the same side; an apparent anatomical contradiction. This was the condition in a patient, a girl of 12, whom I saw in consultation with Dr. Henry B. Sands in January, 1878, and where we subsequently (February, 1879, one and one-half years after the first symptoms appeared), demonstrated that the muscular contraction was reflex, all muscular resistance disappearing under ether. The lesion in this case was a spondylitis sicca in the upper cervical region, and yet there has been no pain present for over a year, and the patient possesses an apparently normal degree of muscular power in flexing, extending or circumducting the head within the limits of the contraction, just as patients with rotary scoliosis possess, in many instances, a considerable degree of strength in the spinal muscles, the exercise of which does not produce pain. It certainly is a remarkable fact which I have seen demonstrated many times, that a prolonged reflex spasm



of certain muscles either of the spine or limbs (yielding wholly under ether) may exist without any history of pain. Another fact, that I have seen too often illustrated to regard as a coincidence, is that in all, or nearly all these cases, the muscular atrophy and spasm could be traced to an osseous lesion, and particularly to the bodies of the vertebræ or the epiphyses.

That muscular contractions occur in the typical, rotary scoliosis is very apparent, and that these contractions are reflex, or due to some specific cause, is equally evident when their nature is studied. These cases form, however, a distinct group, yet the ultimate muscular condition reminds me of that which exists in the lower extremities after infantile paralysis. There are other cases where there is a distinct and readily traced paralysis of some of the spinal muscles. The case of H. D. P. will illustrate this condition. The patient was six years old and was placed under my care by Drs. W. H. Draper and E. C. Seguin. The original lesion was a poliomyelitis. Dr. Seguin has furnished me with a memorandum of the muscles primarily affected. Those partially paralyzed (which recovered wholly under Dr. Seguin's treatment) were the muscles of the neck, arm and thigh (left side). Those wholly paralyzed—and which did not recover—were the left *serratus magnus*, the left *transversalis* and *obliquus externus*, and the *supra* and *infra spinati* of the same side. The vertebral column presented an inflexible dorsal curvature toward the paralyzed side, with the usual compensatory (?) curve in the lumbar region. The most marked rotation that I have ever seen occurred in this case, though, as above stated, the boy was only six years old. There was marked contraction of the unparalyzed



antagonists on the right side. I have seen several of this class, also, and one patient, a girl of thirteen, is now under observation at the Orthopædic Hospital. I mention these cases and describe their condition, because I am convinced, after studying over three hundred cases of the typical, rotary lateral curvature—and especially the development of the muscular resistance—that no analogous muscular contraction exists, in any condition, without some central or marked reflex cause. At any rate, I am prepared to state that rotary lateral curvature has a specific, pathological cause—not merely a mechanical etiology. The absolute demonstration of this statement and the location of the lesion, of course, lie in post-mortem exploration. On another occasion I shall dwell more particularly upon this interesting and important subject.

I have at least demonstrated from a clinical standpoint that a simple, non-specific loss of muscular equilibrium cannot explain the phenomena of a typical, rotary lateral curvature. In other words, the typical, progressive scoliosis does not develop from a simple alteration of the pelvic plane—where an unequal length of the lower extremities causes, in locomotion, a primary lateral curvature in the lumbar region as a matter of compensation. I have carefully noted the comparative length of the lower extremities in over one hundred cases of the typical, progressive, rotary lateral curvature, and I have found only three where the difference in the length of the limbs amounted to three-eighths of an inch, or more. In view of recent statistics regarding the comparative length of the lower extremities,\* this, certainly, is a small percentage, as the patients

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\* Dr. Cox, *Am. Jour. Med. Sciences*, April, 1875; Dr. Wight, *Arch.*



were all either adults or adolescent girls who had nearly attained their growth. On the contrary, where the actual difference between the length of the lower extremities has been great from disease or arrest of development (hip joint disease, infantile paralysis) amounting to from one to three inches, I have found after examining a large number, only two where the typical scoliosis existed, and, from the histories presented by these cases, I doubt, very much, the etiological value of the altered pelvic plane. In these cases a strictly compensatory curvature results,—but it is readily removed by artificially supplying the necessary length to the shortened member, or by placing the patient in the prone position. In closing this digression, I will merely say that the widest difference exists, clinically, between the purely compensatory curvatures, and the other two classes of lateral curvature to which I have referred. The former are strictly mechanical in their origin, and although, after many years, the intervertebral fibro-cartilages may become modified by the unequal pressure, the curvature is, as a rule, easily remedied in the manner pointed out; while the latter, commencing without any apparent, primary, *mechanical* cause, progresses very insidiously, and, if the progressive deformity be not arrested, it ultimates in a condition which is, of all the abnormal positions which the orthopædic surgeon is called upon to treat, the most difficult to relieve.

To revert again to the subject more directly under consideration, we may say that in whatever portion of the vertebral column the inflammation most frequently has its origin, it has,

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*Clin. Surgery*, February, 1877; Dr. Hunt, *Am. Jour. Med. Sciences*, January, 1879.



as before remarked, many features in common with the chronic forms of disease attacking the larger articulations. The minute structure of the vertebræ need not detain us here, nor is it necessary to enter upon a detailed account of the structure, functions or normal motions of the vertebral column as a whole. The tissues most liable to inflammation are those which interest us most, and we may say that the one most liable to attack is the same in the spine as in the larger articulations. The great<sup>s</sup> joint factors are bone, synovial membrane, cartilage and ligaments. We exclude the fibrous capsule, for while it is frequently the seat, especially in the knee, of acute inflammation, it rarely, in my opinion, becomes the seat of primary, chronic inflammation,—and for another reason—the fibrous capsule is not very extensive in the vertebral column, and is situated at points where the disease rarely has its origin.

We find, if we examine the vertebral bones, that the osseous tissue entering into their structure is of two kinds; the soft, spongy bone existing in the bodies, and the hard, compact tissue being found in the laminae, pedicles and processes. Synovial membrane exists to a limited extent only, and is not found at points where pathological exploration has demonstrated the lesion most frequently begins. A mass of ligaments bind the bones together, and a series of fibro-cartilages, making, in the aggregate, nearly one-fourth of the entire vertebral column, are interposed between the bodies. Each vertebra, therefore, rests upon a triangular base, the intervertebral disc forming the medium of support anteriorly and the two articular processes posteriorly.

Histologists tell us that the bodies of the vertebræ are very



vascular, and Kölliker remarks, "Of the short bones I have found the vertebræ to be the most abundantly supplied with nerves, and especially the bodies."\* The synovial membrane, while possessing considerable vascularity, has a much less abundant supply of neural tissue, and Kölliker again states, "In the knee I have seen nerves, even in the true synovial membrane, although in general they are rare."† Nicolodini‡ also demonstrates by the chloride of gold test the existence of nerves in the "intima" of the synovial membrane. But all histologists that I have, as yet, consulted, agree in stating that the bodies of the vertebræ and the vascular epiphysis have a very abundant supply of nerves, while the true synovial membrane has, comparatively, a very limited supply. The epiphyses are *local nutritive centres*—the synovial membranes are *simple serous membranes*. Morris, in his recent work on the "Anatomy of the Joints," remarks that the synovial membranes "are supplied with nerves and absorbents,"—and in speaking of the ligaments he further says: "Often, however, and especially in the larger joints, it is easy enough to follow nerve branches through the ligamentous fibres of the articulation." The "tendon reflex" would seem to sustain this assertion, though Dr. Gowers, after his recent experiments (*Lancet*, Feb. 1st, 1879), was not assured that the seat of the "tendon reflex" was not in the muscles. It is a well known fact, which scarcely needs repetition here, that articular cartilage, in a normal state, is destitute of both blood-vessels and nerves.

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\* Manual of Human Histology, Syd. Ed., Vol. I, page 336.

† " " " " " " 338.

‡ *Stricker's Jahrbucher*, 1873.



The intervetebral discs, according, to Kölliker and others, consist, 1st, of exterior concentric layers of fibro-cartilage and whitish connective tissue ; 2ndly, of a central, principally, fibro-cartilaginous substance ; and 3dly, of two cartilaginous layers applied immediately to the bones. The soft, central substance does not differ materially in its elements from cartilage, for the microscope shows the preponderance of fibro-cartilage cells. These discs contain, like the true articular cartilage, neither vessels nor nerves, in a normal state, but vessels may, under certain morbid conditions, develop in them (Rokitansky, Kölliker). They may also undergo two species of degeneration, viz., atrophy and ossification. The former occurs from very obscure causes, and is accompanied by no marked symptoms. These two conditions are found principally in senile spinal curvatures, though Rokitansky states, "true ossification of fibro-cartilage is, in every case, highly problematical."\* The same authority states, "Inflammation though rarely met with in the fibro-cartilage, does unquestionably occur in them. It is remarkable for its acute course, and for the rapid ulcerative destruction of the fibro-cartilage to which it leads. An inflammation is sometimes met with in the intervertebral cartilages, which terminates sooner or later in suppuration, and is generally combined in the end with inflammation and caries of the bodies of the vertebræ." †

My own experience leads me to believe that an *acute* inflammation of either the intervertebral discs, or of the ligaments, would find expression in considerable pain. We know, for instance,

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\* *Rokitansky's Path. Anat.* Syd. Ed. Vol. III. Page 281.

† " " " " " 279.



that an *acute* synovitis of the knee-joint is exquisitely painful, while a *chronic* synovitis may exist for years without any expression of pain at all. Acute inflammation of any of the appendages of the vertebral bones (excluding those due to direct traumatism) are quite rare, and I have seen only a few cases which could be thus classified. Two of them, I am inclined to believe, were lesions of the intervertebral cartilages, with suppuration. Markedly acute symptoms, high temperature, the rapid formation of pus, and complete recovery in a few weeks with slight deformity and rigidity of the spine, limited to two or three vertebræ, summarize their histories. Primary inflammation of the ligaments, as a factor of chronic spondylitis, I do not think, occurs. Their structure would not predispose them to a chronic form of inflammation. For evident reasons the spinal synovial membrane should not give rise to much trouble, and Brodie, after many post-mortem examinations, says, "Although it is not to be supposed that the synovial membrane belonging to the joints between the articulating processes of the vertebræ are altogether exempt from the liability to inflammation, there is no doubt that inflammation in them is of rare occurrence, and no case has fallen under my own observation in which the existence of such disease was proved by the examination of the dead body." \*

I have analyzed thus briefly the histology and pathology of the important joint factors, so far as the authorities I have referred to throw direct light upon the subject. I might cite others also, were such a course necessary, in confirmation. I have also summarized their pathology in the light of a very

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\* Diseases of the Joints, 5th Ed., page 300.



considerable experience, based upon a service of over fifteen years in public institutions especially devoted to the treatment of deformities, and notably those of the spine and hip. It is, however, to be regretted, that there exist almost insuperable difficulties in the way of obtaining autopsies in dispensary and hospital practice, especially among children. I not only find that many mothers object to leaving their children in any hospital ward, but that the bare suggestion of an autopsy is sufficient to incur the lasting displeasure of the friends of the patient. In dispensary practice patients that are seized with an acute, intercurrent trouble, usually find their way to some general dispensary for treatment, and if death ensues, we are made aware of the fact only when they are beyond the reach of post mortem examination.\* Even if these facts were otherwise, the post mortem appearances of advanced Pott's disease are not always satisfactory, for reasons already stated. I have therefore found my greatest pathological aids from examinations of the diseased tissues in the larger joints after resection and amputation. We cannot observe the spinal column under these favorable conditions. As Dr. Heitzman expresses it in his lectures on the "Development of Bone," when referring to the comparative value of microscopic examinations of recent and dried specimens of osseous tissue, "\* \* \* it is the difference between examining a mummy, and the recently deceased body." In stating the matter in this way, I have no wish to underrate the

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\* Of 299 cases of Pott's disease treated at the Orthopædic Dispensary in 1877, 10 died. One from Bright's disease, 2 tubercular meningitis, 1 whooping cough, 3 pneumonia, 1 diphtheria, and 2 unknown. During 1878, 267 patients were treated for Pott's disease in the same institution. The deaths were 13; 2 Bright's disease, 1 tubercular meningitis, 1 bronchitis, 2 scarletina, 2 myelitis, 2 phthisis, 1 exhaustion, and 2 unknown.



contributions of others, or to expose myself to the criticism of discarding the evidence obtained at autopsies made in advanced Pott's disease. Compared with these latter evidences, however, I regard the fresh specimens examined immediately after resection or amputation, as being far more valuable than those obtained after the changes have occurred which precede and follow death.

Viewed in the light of the symptoms presented, the pathology of chronic spondylitis becomes more interesting, and many important conclusions may be drawn by applying the known histological and pathological facts, to the indices of this insidiously progressive lesion. The most important symptom upon which we are obliged to rely for the early diagnosis of certain forms, (the osteitic) of articular disease and before an actual loss of substance occasions deformity, are those which come to us through the medium of the nervous system. It is a remarkable clinical fact to which, so far as I am aware, I was the first to call attention, that a *chronic* disease may exist in any given articular tissue which is sparsely supplied with nerves, or which is devoid of neural elements, without presenting any *subjective* symptoms which are of sufficient importance to attract the attention of the patient. Instances of this may be found in the chronic lesions of the synovial membrane, and the cartilages of the larger articulations. Atrophy and almost complete disappearance of the cartilage may occur without any symptom during life, as before stated, and among the many instances of chronic synovial inflammations which I might cite, I will briefly state the case of a young lady of 22 years, who recently consulted me regarding a diseased knee. The history of the case covered



ten years, and the first symptom noticed was a simple, painless swelling of the joint. Local rise of temperature occurred later and has been present most of the time, but the important fact that I wish to call attention to is, that during the past year only, has there been any pain. Since the bone has become involved in the diseased process which originated years ago in the synovial membrane, there has been limping, (there was none before, except after very long and fatiguing walks), nocturnal pain, "starting of the limb," contraction of the joint, and a more rapid atrophy of the muscles. When the bone becomes involved, the neural response is unmistakable. The marked reflex spasm of the muscles occurs quite early in all inflammations involving the epiphysis or bodies of the vertebræ, and is almost uniformly absent, or is developed only to a slight extent, in all true, chronic synovial inflammations. It has become an interesting matter in this connection to study the origin of the nerves which supply the vertebral bodies. It has been demonstrated by Kölliker, Luschka and Kobelt, that the nerves which terminate in the vertebral bodies can be traced not only to the cerebral and spinal nerves, but also to the great sympathetic. In this way does the irritation of the peripheral nerves supplying not only the vertebral bodies, but also the larger epiphyses (for the same thing has been demonstrated in connection with them) give expression to such a variety of neural manifestations, viz., pain, (which may or may not find expression orally); a peculiar, persistent and involuntary muscular spasm; a pronounced and direct atrophy of the muscles thus affected; an agonizing and piercing nocturnal cry, (which, however, may be present only for a limited time), and a general, particularly a facial, express-



ion of suffering not always seen in the more especially fatal chronic diseases of other tissues. In the same way may be explained the absence of these symptoms where a tissue with a sparse neural basis\* is attacked with the same chronic inflammation. In other words these simple facts explain many important differences which exist between chronic osteitis and chronic synovitis, and they form valuable aids in the differential diagnosis of these two conditions, as I have pointed out in the Clinical Lecture before mentioned.

The primary lesion in Pott's Disease gives marked evidence, in all but exceptional cases, of these early and marked neural symptoms. In chronic disease of the knee-joint, for instance, we look for our first symptoms to the bone or synovial membrane. The latter present only, at first, *objective signs*—without any important *subjective symptoms*. In the spine we must look to the bone for our first symptoms, for the intervertebral discs, like the synovial membrane in the hip-joint, may, I believe, continue in a state of degeneration for a long time without giving any important evidence of the fact. The cartilage becomes primarily affected, in exceptional cases only. Those cases in which I have been able to diagnose an *acute*, fibro-chondritis, with suppuration, the patients have recovered without any deformity other than a slight irregularity, with rigidity, limited to two or three vertebræ, as before stated. I can imagine, however, that the intervertebral fibro-cartilage

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\* It is probable that the great difference existing between the symptoms of chronic osteitis and chronic synovitis which are here pointed out, arises not only from the inequality of the neural distribution to these two important joint factors, but also from the fact that the synovial membrane being a simple tissue, like other serous membranes, and not a local nutritive centre, like the epiphyses, does not possess such profound and intimate relations with the great nerve centres.



may become diseased without involving the bone. Brodie states\* that he has observed ulceration of the intervertebral cartilage where the bones were "in a perfectly healthy state." I can understand how a central osteitis may occur in a vertebral body without producing disintegration of the disc. But, other things being equal, and the fibro-cartilage depending for its nourishment upon the bone, it is very exceptional that the initial lesion of either Pott's disease, or chronic osteitis of the knee-joint, for instance, occurs in the cartilage. In any event, in chronic joint affections, until the bone is involved, the marked neural symptoms do not occur, and I may repeat here the conclusion I reached in my study of the "Etiology and Pathology of Chronic Joint Disease," viz.: that "*reflex muscular spasm in chronic joint disease always indicates osteitis.*" That this muscular spasm is always present, to a greater or less extent in chronic osteitis affecting either the articular ends, or the bodies of the vertebræ, I am assured. Its presence is due to a direct pathological cause and is not "conservative"—a fact which I have taught for the last two or three years at the Orthopædic Dispensary—and was, I believe, the first to point out. This pathological, yet local, muscular spasm is easily explained, and its purely reflex character may be demonstrated by the administration of an anæsthetic—when, if the muscle has not undergone structural change, the spasm will wholly disappear, and the "fibrous ankylosis" gives way to a perfectly movable joint. In the early history of the spasm, the patient can voluntarily exercise the affected muscles within certain limits, as is illustrated in the case of spondylitis sicca

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\* *Op. cit.* 5th Ed., p. 301.



seen with Dr. Sands; but in the latter stages, the muscular spasm does not permit the patient either to flex or extend the joint. The muscles become, in the first stage, temporarily contracted under the stimulus of extreme motion or pressure, and in the last stage, this spasm may so fix the joint that no motion can be detected by the most delicate examination, and this long before the muscles become structurally shortened.

After all, viewed in the light of their symptoms there are but few important differences between a chronic spondylitis, and a chronic epiphysitis of one of the larger articulations. The pain at the periphery of the spinal nerves—first noticed by Brodie—has its analogue in the pain at the knee in hip-joint disease. The reflex muscular spasm which renders the vertebral column, at the point of disease, very rigid, also finds expression in the same localized, muscular spasm which occurs in coxo-femoral osteitis. The hip joint is not only held rigid by the muscular spasm, but the various positions assumed by the thigh, producing the deformities in joint disease, are due to the same cause. In some other respects the two conditions resemble each other, but enough has been said regarding the similarity of these two pathological states. That the symptoms are so nearly allied is, at least, corroborative evidence that, in chronic disease of the articulations of the lower extremities, the lesion most frequently to be diagnosed is a *chronic osteitis*, and not a *chronic synovitis*.

Several practical deductions based upon many experiments and observations of the phenomena of chronic diseases of the hip and knee, may be of value here as bearing upon the mechanical treatment, which I shall soon consider, of Pott's



disease. 1st. A severe examination of a diseased joint by making forcible and extensive movements of the articulation, under ether, is almost always followed by a decided aggravation of the symptoms; 2ndly; If ether be administered with a view to perform tenotomy of the contracted muscles, and the contraction disappears after the anæsthesia becomes profound, the mere division of the tendons will accomplish but little, for the spasm will recur as soon as the reflex power is recovered, and the complete reunion of the tendon is a question of a few days only; 3dly; So long as the joint movements are impeded by this localized, reflex muscular spasm, during consciousness, and all muscular resistance disappears under ether, an osteitis of, or near, the articulation exists; 4thly; As in chronic epiphysitis, so in chronic spondylitis, the reflex, tetanoid spasm yields to ether, but not to such agents as morphine and chloral, if administered in the customary doses.

While suspension is employed now-a-days "to reduce the deformity" of Pott's disease, it cannot, for reasons to be assigned hereafter, do more than modify the compensatory curves, unless, ether be administered after the plan of the German surgeons. If this be done—and it cannot, in my opinion, be other than dangerous, or at best, useless—it will be found that the pathological curvature is more readily reduced, inasmuch as the reflex spasm yields when an anæsthetic is administered. It is due to the presence of this muscular spasm, during the process of suspension without an anæsthetic, that more harm is not done by the rejuvenated custom of using "the gallows" in the treatment of Pott's disease.



## CHAPTER II.

## TREATMENT.

It would be a very difficult matter to name the many writers upon Spinal Deformities. From the earliest times the subject has received the attention of the medical profession. The searching analysis which many works upon deformities have received in the columns of the *Medico-Chirurgical Review* conveys many wholesome lessons that might well be heeded by the writers of the present day. The frequency with which these essays appeared is illustrated by quoting from some of the reviews in the periodical above referred to. In 1825, the review of Bampfield commences with these words: "Of late years works on the Spine have presented themselves in as regular succession as the ghosts of Banquo."—In 1831, Beale is reminded that "works on this subject have been surprisingly numerous of late years."—And in 1852, a carefully prepared analytical review of Bishop, Tamplin, Verral, and Godfrey has this initial sentence: "Each successive year produces its crop of books on Deformities just as regularly as the strawberries appear in June." The reviewer then states: "The burden of the whole of them is nearly the same; there may be an exception here and there, but the vast majority of them speak as follows: \* \* \* The author has met with unexampled success in this department of his profession, and \* \* \* has invented



(some of them call it *discovered*) an instrument which he can guarantee will screw the most crooked back straight again. Many other persons profess to do this, and perhaps honestly think they can do it; and far be it from the author of this veracious treatise to insinuate that they are quacks. He owes a duty, however, to the public; and he regrets to say that a short time ago he saw a deplorable instance of the mischief which had been produced by the machine of Mr. A. of B Square, and that he was recently consulted by a lady whose daughter had been under the care of Messrs. C. D. E., and also the aforesaid A., but who had derived no benefit from their prolonged and expensive attendance. It was his better fortune, however, owing to the more scientific principles upon which he went to work, to achieve a more favorable result; in this instance, one of the worst he had ever witnessed, the patient has been restored to her sorrowing friends and is now the life of her social circle, the most active among the active, and the sweet dispenser of the best form of charity—in the shape of advertisements and recommendations to the author and his establishment.” \*

It would seem that the practice of attempting to enhance one's reputation by publicly commenting on the alleged ill success of others—a proceeding which many of our profession witnessed in this city not long ago—does not possess even the merit of originality.

I have been fortunate enough to obtain a very considerable number of works upon spinal deformities. A careful perusal of them leads me to express surprise that so little at-

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\* *British & Foreign Medico-Chirurgical Review*. Vol. X, 1852, page 164.



tention has been paid by the vast majority of their authors to the actual pathology of the diseases which produced the deformities. Had the pathology of the different lesions been studied more carefully before the treatment was devised, there would have been far fewer "machines" and much less suffering would have been inflicted by the various, crude appliances that are pictured in the works of many writers, even of recent date. It has been the habit of many of these authors to ignore the pathology, and to then "devise" a mechanical treatment. They have apparently looked upon the distorted spine as a mechanic would contemplate a curved, metallic bar, which needed only a certain degree of force to straighten it. But, as the spines are bent in obedience to a mechanical law—of course—but not from a primary mechanical cause, the curvatures, in many instances, went on progressively just as if they had not been treated from an empirical standpoint. And herein, in my opinion, lies not only the error of the past, so far as the scientific treatment of spinal curvatures is concerned, but also the danger of the future. It is a proposition which, I think, can be easily demonstrated, that errors of form which do not involve vital parts, and which are due to, strictly speaking, mechanical causes alone, need, as a rule, mechanical treatment only. But the deformities of the spine having their origin in the lesion which produces Pott's disease, and in the primary change which ultimates in the typical and progressive rotary lateral curvature, have many elements which cannot, I am convinced, be explained upon any mechanical or traumatic basis. We are apt in Orthopædy, as in other departments of Medicine to confound *cause* and *effect*, and thus a series of etiological errors have



arisen, based upon mechanics and traumatism, which cannot be too soon removed. Years of study and exploration will probably pass before many of these errors can be removed. In the meantime various opinions will be held;—the human body will be looked upon, by some, as a simple series of mechanical actions, and “machines” will be made with the object of accomplishing the impossible. Mechanical “demonstrations” of the etiology of lateral curvature, for instance, illustrated in the dried and mounted vertebral column, and arranged with obedient springs and checks, cannot represent the curving spine with its multiplicity of functions and levers, and the vital force controlling and operating them;—nor can the progressive deformity of Pott's disease be explained upon the basis of traumatism and gravity. The agencies at work in the production of spinal curvatures—whether lateral or posterior—would operate, I am convinced, in many cases, were both these elements removed; and while *they both become very important factors after the lesion is established*, we must look further and deeper for our primary cause.

In entering directly upon the treatment of Pott's disease, I shall avail myself, as I did in studying its pathology, of my experience in treating analogous inflammations of the larger articulations. There are so many points in common, as relating to the etiology, pathology and symptoms of these two conditions of chronic spondylitis and chronic epiphysitis in children, that it would be difficult to consider the one condition, in the present state of our knowledge of these diseases, without drawing conclusions based upon our observations, both clinical and pathological, of the other.



The difficulties in the way of successfully treating Pott's disease mechanically are, sometimes, very great. If we were dealing with a simple traumatism as a cause, and gravity as a second factor, the mechanical treatment of Pott's disease would present scarcely greater difficulties than the mechanical treatment of fracture, for instance. Unfortunately, as I have pointed out when considering the pathology of this lesion, we have to deal with a very insidiously progressive disease, where very important factors in the production of the increasing deformity have been either ignored or overlooked by those who claim that the lesion has a traumatic etiology. And I may also say that many of those who have regarded the disease from a constitutional standpoint have also disregarded certain pathological conditions which contribute to the progressive character of the disease. A progressive inflammation, involving a gradual loss of substance—whether by a process of "regressive metamorphosis," which ultimates in a flocculent discharge, or a fungous proliferation unaccompanied by suppuration, and occurring in such a tissue as we have found the vertebral bodies and the epiphyses to be,—must, it seems to me, be accompanied by peculiar manifestations. I have tried to point out what some of these manifestations are, and to trace their relation to the lesion. It is the pathological value of these symptoms to which I wish to call attention among other matters, in pointing out the mechanical difficulties which present in the treatment of chronic spondylitis.

And first let me ask, is there any mechanical treatment which can wholly cover the pathological condition met with in a typical case of Pott's disease? Can we expect any mechanical treatment to always, or even as a rule, cure a progressive lesion



of such magnitude as that we have attempted to describe? Are we justified in claiming that we can accomplish any more, by an artificial mechanical appliance, in an osseous disease where motion acts as a great factor in aggravating the symptoms, and where the lesion exists in a tissue especially endowed with vessels and nerves, than we can in a somewhat analogous pathological condition in the shaft of a long bone when the mechanical treatment is supplied by nature herself? There are those who claim that we can. I differ from the gentlemen who make the assertion that Pott's disease is traumatic in its origin, and hence quite easily cured, and I do not deem an apology necessary in this connection for the statement that my conclusions are founded upon an experience which is based upon an aggregate of many thousand cases of joint and spinal disease, the histories of over four thousand of which were either recorded by myself, or taken under my personal instruction.

What then should be the indications for the mechanical treatment, for all will admit, in any event, that the elements of locomotive traumatism and gravity, after the lesion is established, make mechanical treatment of some kind absolutely necessary? Perhaps I can better answer this question, after experiments directly bearing upon this point, by stating what they should *not* be. 1st. Mechanical treatment, either in the spine or larger joints should not be used with the idea of overcoming the muscular resistance. We may succeed in antagonizing the muscular spasm to a certain extent, but it cannot be annulled by any mechanical therapeutics we may devise. As I have previously stated, neither morphine nor chloral, even in quite large doses,



perceptibly modifies this tetanoid spasm in a well developed case. 2ndly. The traumatism of suspension, like the traumatism of forcible examination in articular osteitis of the hip, has in my own experience, in some cases, aggravated the lesion, increased the subsequent muscular resistance and intensified the pain. I have seen irreparable damage inflicted by an unnecessarily severe examination of a suspected hip joint under ether, and I have known more than one case where the error was made of eliminating any joint lesion because "stiffness of the joint" relaxed under an anæsthetic. Even more—I have had cases under my care, where the surgeon previously in charge of the case had diagnosed an "hysterical joint," a sciatica or a rheumatism—for the same reason. It is a fact which cannot be mentioned too often, *that the reflex spasm of the muscles in chronic osteitis of the larger articulations will yield to anæsthetics only, and that the anæsthesia produced by ether or chloroform suspends all the really important symptoms upon which we should rely for our diagnosis, especially in the early stages of the lesion.* Hence, as a rule, ether should not be administered in joint disease for diagnostic purposes, except to eliminate doubtful points, and for the purpose of ascertaining the condition of a joint with reference to exsection. Some German surgeons have recently administered anæsthetics in cases of Pott's disease, prior to the application of the plaster jacket. Under these circumstances it is found to be a comparatively easy matter to reduce the pathological curvature. We see here, again, the effect of anæsthesia upon the muscular spasm, for, without ether, I have never seen the true pathological curve reduced by suspension. This procedure, which I have often



wished to test but never cared, for obvious reasons, to attempt, has determined a question which would still remain unsettled without some such demonstration. It proves that the weight of the body, acting as a counter extending force during suspension, is not sufficient to modify the curvature due to the lesion itself, while if, under the same circumstances, ether be administered, the projection is more easily reduced. If, in the first instance, the kyphosis remained unchanged from adhesions which had taken place, it would have remained so under ether, other conditions, of course, being equal, and the modification of the true curvature under anæsthesia demonstrates, to my mind, with a multitude of similar experiences in the hip and knee, that the reflex muscular spasm is as important a symptom in chronic spondylitis as it is in chronic epiphysitis, and that it bears the same relation to the lesion.

With these preliminary remarks, I will proceed to detail the results of my experience in the mechanical treatment of Pott's disease, and to consider the two most prominent methods now before the profession.

The mechanical treatment of the two conditions most frequently mentioned in this essay, viz., Pott's disease and hip-joint disease, varies with the widely different functions performed by the structures involved. In hip disease, for instance, we have a lesion involving only one articulation, and as, anatomically, there are excellent opportunities to make both extension and counter-extension, we can so apply our force against the tuber ischii as to produce that kind of fixation which relieves much of the pain, antagonizes, to a greater or less extent, the muscular spasm, and places the joint under the best local con-



dition for repair. But the spine does not offer any anatomical facilities to apply such a method of treatment, and it is absolutely impossible to apply a continuous extension and counter-extension which can be maintained with any degree of success.\* It would be an especially difficult task to so direct the extension that the ultimate force would be expended upon the diseased bones alone. Let us suppose, for instance, that six or eight bones are diseased, the intervertebral discs disintegrated and the ligaments badly implicated, as is not unfrequently the case, how could we be assured that the extension reaches all the diseased tract? When extension by means of suspension is applied, as it frequently is now-a-days, to the whole vertebral column from the first cervical vertebra down, in cases of spinal disease and the curvatures resulting therefrom, how much of the apparent change that takes place in the projection is due to the effect produced upon the projection itself? It is a well-known fact that our height is increased in the morning after a few hours' rest in the recumbent position. Extension made through the healthy intervertebral fibro-cartilages and the other structures binding the vertebral bones together, for a few moments only, is capable of lengthening the vertebral column to a very considerable extent. How much one-half hour's extension or suspension would stretch these healthy tissues I do not know. But when the extension is applied to the healthy spine the normal curves are also obliterated and the spinal column becomes straight, as it is in early infancy. When the same force is applied where a portion of the vertebral column

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\* I have had no occasion to change my opinion regarding this statement, even after reading Dr. Wyeth's paper on "The treatment of Spinal Curvature by Continuous Extension."—See *The Hospital Gazette*, Jan. 30th, 1879.



is diseased, the compensatory curves which result from the changed centre of gravity are also greatly modified, and the deformity is thus placed under far different relations to the healthy parts of the spine, and without, in my own experience, affecting, to any appreciable extent, the true, pathological curvature. In other words, the change is apparent rather than real, and the great increase in height noticed after a suspension of this kind, is due to the extensibility of the unaffected structures, and the obliteration or modification of the compensatory curves. There can be no actual lengthening of the vertebral column except that which comes from the elastic nature of the ligaments and fibro-cartilage. If, after applying suspension, the projection should decrease it is due to the separation of the diseased osseous surfaces at the expense of pressure upon the articular processes—making a lever of them, in other words, the weight of the body below forming the resistance, and the cervical region being the seat of the application of the suspending power. If suspension separates the bones, it does so at the risk of breaking up any reparative process that may have begun, and I am inclined to think that it may accomplish more, in this respect, than is advisable in advanced cases, and if this same force be used, the tetanoid spasm of the muscles prevents, in a great measure, separation of the diseased surfaces in the more recent cases.\*

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\* If we place a patient with hip disease upon a soft mattress in the supine position, and after flexing the thigh and grasping the pelvis, attempt rotation of the hip joint, we find, in many instances, that little or no motion can be developed in this direction. If the case be one of *caries sicca*, I find it happens very frequently that, after having made this test, the limb be allowed to lie quietly upon the mattress for a few moments, quite a degree of rotation can then be developed, if the entire limb be allowed to rest upon the bed, and only a gentle force be applied at the knee.



Recumbency, in the prone position for a few moments, will produce all the "separation" necessary; indeed, all the "separation" required is that which produces an adequate modification of the injurious pressure or contact. This gained, we have accomplished just as much, as a matter of treatment, as if we had actually drawn the bones asunder, and the gap thus created by, what must necessarily be, forcible means, cannot, I am convinced, be filled by osteophytic action.

I have seen cases where the projection apparently decreased under the extension produced by suspension.\* I confess that in these cases I have proceeded very carefully with the plastic envelope. But these patients have done no better than others. My experiments have proved to me that the weight of the body below the point of disease could not overcome the reflex muscular spasm which resists our mechanical efforts to overcome it. It is, probably, very fortunate that this is so, for even if the spine could be straightened it would lead to false hopes of a speedy cure; and what right have we, even if continuous extension and counter extension could be accurately maintained, as in cases of hip and knee-joint disease, to expect that we could cure spinal caries any more rapidly than either of these former conditions, which, even under favorable circumstances, may take years to accomplish? Another fact I have noticed is, that when patients return for a second application of the plaster jacket, I have found, before

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\* I am convinced that this apparent decrease arose from the fact that the compensatory curves were so great, producing such a marked effect when suspension was used, as to leave the impression that the pathological curvature had been actually reduced. If only two vertebræ are diseased, for instance, the resulting posterior curvature may seem to involve the three or four contiguous bones above and below. It is especially under these circumstances that I have found such marked changes without affecting, in reality, the real projection.



the old apparatus was removed and suspension again applied, that the spine had fallen back, to its old position, or nearly so. It is certain that a comprehensive mechanical extension in a typical case of dry osteitis of the hip or knee joint does no more than to slightly modify the reflex muscular spasm.\* Suspension or extension, even if they could be made continuous, can do no more in Pott's disease. Some years ago it was the custom to treat hip joint disease by applying a plaster of Paris splint, after extending the limb. This plan was thoroughly tried, found useless and abandoned. It would be as scientific, in the present state of our knowledge of the pathology of hip joint disease, to suspend the patient by the leg while we put a plaster jacket on his hip, as to expect, by simply suspending the patient by the upper vertebræ, making him (we will say), one or two inches taller at the expense of healthy tissues and the modification of the compensatory curves, and then permitting the spine to gradually sink back into its old position, we could cure spinal caries more rapidly than by a more reasonable and a more scientific method.†

To those who have had a considerable experience in the treatment of chronic articular diseases, and more especially Pott's disease, I am, I know, expressing a very common expe-

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\* That "extension with motion" is a fallacy in the mechanical treatment of *chronic osteitis* of the hip or knee, is very easily demonstrated.

† A case now in my service at St. Luke's Hospital will illustrate some of these points. The patient, a boy of 6 years, has Pott's disease in the dorso-lumbar region, involving four vertebræ. In the course of five months I applied three plaster jackets, carefully and snugly, after suspension. When the first jacket was removed, the projection was evidently larger, and this was the case after each of the others had been taken off, until, when the last one was removed, the deformity had increased nearly  $\frac{3}{4}$  of an inch. The patient was carefully watched, and I personally inspected the jacket several times a week during the treatment.



rience when I say that the application of almost any support which acts upon correct principles, affords almost instantaneous relief. In some cases the primary effects are almost magical, and are apt to mislead those to whom the scientific, mechanical treatment of articular diseases is a novelty. In dispensary and hospital experience—as well as in private practice—I have frequently had occasion to remark this fact. But relieving the symptoms and curing the disease are two very different matters. Treatment by the gypsum bandage forms no exception to the rule which applies to the other forms of apparatus—or, indeed, which applies to any local measures adapted to the treatment of a constitutional disease. The same may be said of the actual cautery in Pott's disease—it affords temporary relief in many cases—but it cannot be called curative any more than any other form of efficient counter irritation. It has been my experience, for instance, to apply a plaster jacket to a patient—a little boy (not the one referred to in the last foot note) in my service at St. Luke's Hospital. It was, apparently, a favorable case, and one where a good result might be anticipated. The disease was in the lower dorsal. His breathing became better after the jacket was applied, pain was relieved, the patient walked with a firmer tread, and, to the uninitiated, the result promised brilliantly. I had seen too many other cases, however, of similar character treated by various methods, which progressed in the same satisfactory manner for awhile, to expect too much of any local treatment. The patient died in a few months from amyloid degeneration. I have seen many cases of Pott's disease, promising cases too, improve at first very markedly under Taylor's antero-posterior



support,\* only to find in a few weeks that the *psaos magnus* was contracting as a premonitory symptom of abscess, or some other complication presented which would cause those who might formulate a brilliant prognosis in the early history of the mechanical treatment, to very materially modify their opinion. This much may be stated as the result of my clinical experience,—suspension, with the application of the plaster jacket is not so likely to cure caries of the vertebræ as would the same methods applied to caries of the larger joints. The fact is that, after a chronic disease has been once set up in a vertebral body or an epiphysis, there is nothing that aggravates the morbid process, or produces pain and suffering, more, than the traumatism which results from the movement and pressure which is imparted by locomotion. It not unfrequently happens that about all that *any* apparatus accomplishes is to prevent this traumatism, and in this way to modify, or greatly mitigate, the symptoms. So in Pott's disease, apparatus rightly constructed, be it of steel, or plaster, prevents motion at the point of disease. But the disease still exists, and although the apparatus places it under conditions favorable to recovery, the result, not unfrequently, is beyond our control. If Pott's disease were traumatic in its origin, as many seem inclined to believe, no doubt a speedy cure would result under any comprehensive local treatment embodying correct principles.

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\* To avoid repetition and ambiguity, I will here state that when the phrase "antero-posterior support" is used in the subsequent pages, that form of apparatus which embodies the principles of the "Taylor's spinal assistant," or the "Davis spinal brace" is indicated, unless otherwise specified. In like manner, "plaster jacket" refers to the method and apparatus which were first used by Dr. Bryan in the treatment of Pott's disease, and subsequently introduced to the profession by Dr. Sayre.



I would say a few words more regarding the great relief that follows the use of a properly adjusted apparatus in Pott's disease. It is so marked in many cases, that the friends of the patient look forward to a rapid cure. Sometimes,—not rarely, I am sorry to say,—the surgeon lacking experience, or, it may be, being too enthusiastic regarding a favorite method, finding all subjective symptoms removed and an apparently arrested deformity, proceeds to remove the support, and to discharge the patient as cured. Following some slight indiscretion, perhaps,—but this is not always necessary—a relapse undeceives both patient and surgeon. These are very unpleasant facts but clinically they need no demonstration. A very considerable experience with the plaster jacket and other methods of support, warrants me in saying that I do not believe any apparatus is capable of accomplishing such uniformly good results as those claimed for the jacket. I have seen many excellent results follow the use of the antero-posterior support long before the introduction of the plaster jacket. A conscientious use of the latter shows inferior results, and the apparatus is open to objections which will be mentioned later.

It is attempted, in using the gypsum bandage in the treatment of Pott's disease, to maintain that position of the spine which is acquired by suspension, by means of the plastic material employed. For the reason that the bandage encircles the thorax and abdomen, it cannot, as a bandage, pass above the axillæ. It becomes obvious, that, as a support, the plaster jacket, *per se*, ceases to be operative above the seventh dorsal vertebra. (Of 666 cases of Pott's disease treated at the Orthopædic Dispensary prior to 1876, 516 were either cervical or dorsal). How-



ever, in order to make the gypsum base operative for disease in the upper dorsal, and cervical regions, a curved iron bar is imbedded, by Dr. Sayre, in the plaster and passed over the head,\* with which the attempt is made to extend the spine, or to support the head by a submaxillary and an occipital strap. That this method must prove inoperative as an effective means of extension is obvious, for what child could, or would, tolerate an absolute extension force to the head for a length of time sufficient to cure a spinal caries, at, for instance, the second to sixth dorsal, the region most difficult to control in the whole vertebral column? This ungainly and defective apparatus, as a means of support, cannot be compared to the light and comfortable chin piece devised by Dr. Taylor, which makes the treatment of cervical caries one of the pleasures of the orthopædic surgeon. In any event we would discard the plaster above the seventh dorsal, which limits its use to only ten of the vertebræ, and these ten, the five lower dorsal and the five lumbar, are the most easily controlled and supported by any apparatus. As shown by the statistics quoted above, these ten vertebræ are not so likely to be affected as are the other fourteen.

I may state, further, my views in general upon the comparative merits of the antero-posterior support and the plaster jacket. The former acts scientifically upon the principle of a lever with the fulcrum at the point of disease. The points of pressure are the pelvis, which forms the basis of support; the transverse processes of the diseased vertebræ and those immediately con-

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\* This "jury-mast" is pictured in Shaw on "Distortion of the Spine," Supplement, 1825, page 100.



tiguous to them, (the fulcrum), and the anterior, superior wall of the thorax and the axillæ, (the resistance). A sufficient *power* is thus maintained, through the medium of the two uprights of the apparatus, to support the spine in the position acquired by recumbency. In my own hands (though it is not perfect), it has accomplished many excellent results in the treatment of Pott's disease, without any of the objections which pertain to the plaster jacket. It can be easily applied and it requires no more training or ability to adjust it intelligently and effectively, than it does to apply a gypsum bandage. A country practitioner, with a village blacksmith (though this is not necessary) could treat any case successfully with a few practical hints, which would be materially strengthened, of course, by a clinical demonstration. The many advantages which the antero-posterior support possesses (especially the modification I have used), will, I hope, induce many to use it who have perhaps, been led to infer from the exaggerated statements of the foremost partisans of the plaster treatment, that the gypsum bandage forms the basis of the only scientific mechanical treatment.

The principal advantages of the antero-posterior support are, 1st. The ease with which it can be adjusted, and the great comfort experienced by the patients who wear it. 2ndly. It can be removed with safety at any time by placing the patient in the prone position, when such modifications can be made as are necessary to the comfort of the patient, or the treatment of the case. 3rdly. The concentration of the requisite pressure at suitable and convenient points without interfering with transpiration or respiration, and finally, the cleanliness and



lightness of the whole apparatus ; matters which certainly ought to be consulted in a long and necessarily tedious treatment.

On the other hand, the objections to the plaster jacket are, 1st. Its great weight and the necessary occlusion of so large an area of skin. 2ndly. The great danger of excoriations which may develop any time and remain hidden for many days or weeks. 3rdly. The absolute necessity of suspension each time the curvature is inspected or the patient cleansed. 4thly. Its great filth, and lastly, its failure to accomplish, in the great majority of cases, for reasons I have assigned, the objects for which it applied. Among those who are able to purchase a steel support, there is certainly no necessity for the adjustment of a plaster jacket, for the simple reason that all that the plaster apparatus accomplishes and more beside, can be accomplished by a suitably adjusted and accurately fitting antero-posterior support ; while among the New York City poor, where so many are huddled together in tenement houses, and absolute cleanliness is very difficult of attainment, a plaster jacket soon becomes a nest for all sorts of vermin. Several dispensary patients have begged me to remove the jacket on this account, and more than one, after repeated trials, has declined to have the plaster splint readjusted, because the projection steadily increased under its use.

I have earnestly endeavored to weigh the merits of the plaster jacket as a mechanical aid in the treatment of Pott's disease. I regret that I can find so little to commend, and so much to condemn, regarding its use. I can safely say that with less trouble, though at a little greater expense, much more satisfactory results can be obtained by the intelligent use of



the antero-posterior support. I do not mean to say that the gypsum splint should be wholly discarded in the treatment of Pott's disease. It may be made very useful—where the pecuniary condition of the patient will not permit the expenditure of the small amount necessary to purchase a suitable antero-posterior support—in the comparatively limited number of easily controlled cases occurring below the seventh dorsal. In this region, if applied by the surgeon himself, it affords a much better support than *any* other form of apparatus, adjusted by an instrument maker at the request of the physician, who, through inexperience or indifference, delegates this essential part of the treatment to the uneducated mechanic. It is not the fault, either of the medical profession at large, or the students who are now attending lectures, that they have not been, and are not taught, comprehensively, the subject of mechanical therapeutics as applied to the treatment of chronic and progressive deformities. Dr. Sayre, for instance, places himself on record as saying that he employs the plaster jacket “to the exclusion of all other methods of local treatment” \* in Pott's disease. Among the other teachers of general or orthopædic surgery in our colleges I have not succeeded in finding one who gives a systematic course of instruction upon the various and complex mechanical indications to be met in the treatment of this insidiously progressive lesion. Instrument makers, who make no pretensions to special training or anatomical knowledge; mechanics who know nothing whatever of the pathology of the disease, are the source to which many practitioners look for

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\* *Spinal Disease and Spinal Curvature.* By L. A. Sayre, M.D. Smith, Elder & Co. 1878. Page 1.



assistance or advice, after leaving college, in treating a case of joint disease. And some of these mechanics, being under no obligation whatever to follow the ideas of the surgeon who first devised a given splint for any purpose, are very prone to introduce so-called "improvements," which, in many instances, render the apparatus practically inoperative. And hence it sometimes occurs that a general practitioner, even if he wishes to use a given form of apparatus, is not certain to obtain the appliance he seeks.

I have no doubt that much of the ill repute that attaches to many forms of apparatus, and many of the failures that have resulted from their use, have arisen from one or both of these causes. And this state of things will continue, and many valuable aids will be lost to the profession, until the student is taught with system and detail, in the various medical colleges, to do with *all* forms of apparatus, which have proved of value in the treatment of deformities, as he has been taught to do with the plaster jacket, viz., to first understand the principle of the application of the apparatus, and then to perform his own work untrammelled by untrained mechanics. Upon this basis the surgeon will find that the treatment of any case of Pott's disease, with an efficient form of antero-posterior support will prove far more satisfactory to himself, and far more comfortable to his patient, than the gypsum apparatus, which not only necessitates injurious procedures in its application, but which fails, for reasons already pointed out, except in a limited number of cases, to accomplish satisfactorily the object for which it was devised.

Clinical experience has taught me to divide the vertebral



column into three regions, so far as the mechanical treatment of spinal caries is concerned. The *first* region includes the lumbar and the last five dorsal; the *second* comprises the first to the seventh dorsal,—both inclusive; and the *third* includes all the vertebræ above the first dorsal. The mechanical treatment of chronic spondylitis in these three regions presents either peculiarities or difficulties which modify not only the treatment but also the prognosis. I feel warranted, therefore, in calling especial attention to them.

When the disease occurs in the first region (the dorso-lumbar) the mechanical problem is very simple. It is comparatively easy to adapt any of the various antero-posterior supports in use with the effect of preventing any considerable increase of deformity. With a tolerably firm pelvic base, the axillæ and the antero-superior wall of the thorax (being situated higher up than the diseased point) may be made the means of maintaining the requisite degree of fixation and support. As a rule also, Pott's disease, occurring in this region requires the minimum amount of watching, and the greater number of cases reported, by many writers, as cured, are selected from this region.

In cases involving the middle region (the superior dorsal) we find many difficulties presenting in the way of securing an adequate degree of fixation. The indications are to support a rigid projection in the middle of an, otherwise, flexible column. In addition to this, we have to contend with the constant traumatism which results from the respiratory movements of the ribs. In this region it is very difficult to adapt any apparatus which will satisfactorily meet all the indications. The antero-



posterior support, starting with the pelvic base, sends a long arm to the projection, and its efficient leverage is affected by the fact that the upper arm, held by the superior thoracic and axillary straps, is too short to exert an adequate counter-pressure. If we surmount the antero-posterior uprights with any

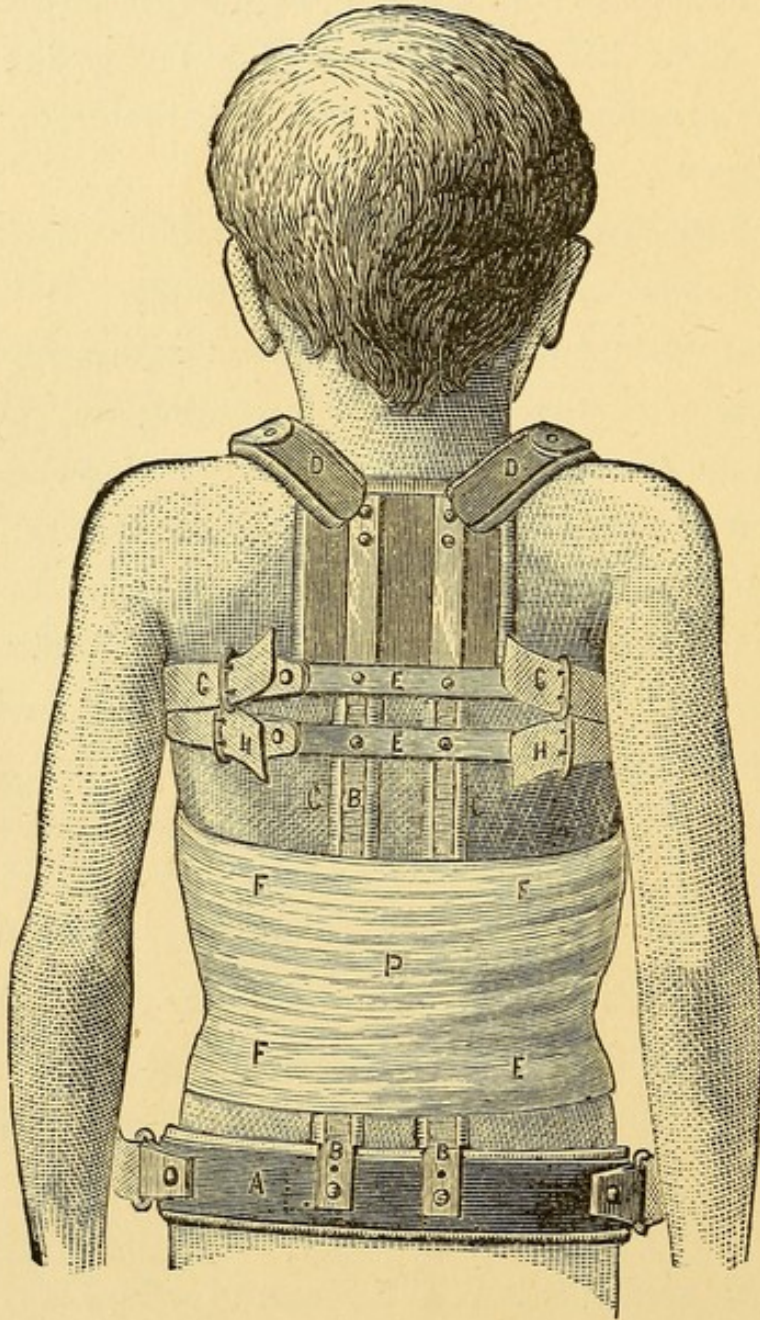


Fig. 1.



conceivable head-rest, we cannot, even then, secure the vertebral column satisfactorily. The plaster jacket, in this region, as I have already pointed out, is inoperative, and the ungainly "jury mast,"—which I saw used in the Hospital for the Ruptured and Crippled, as long ago as 1863—exerts no competent

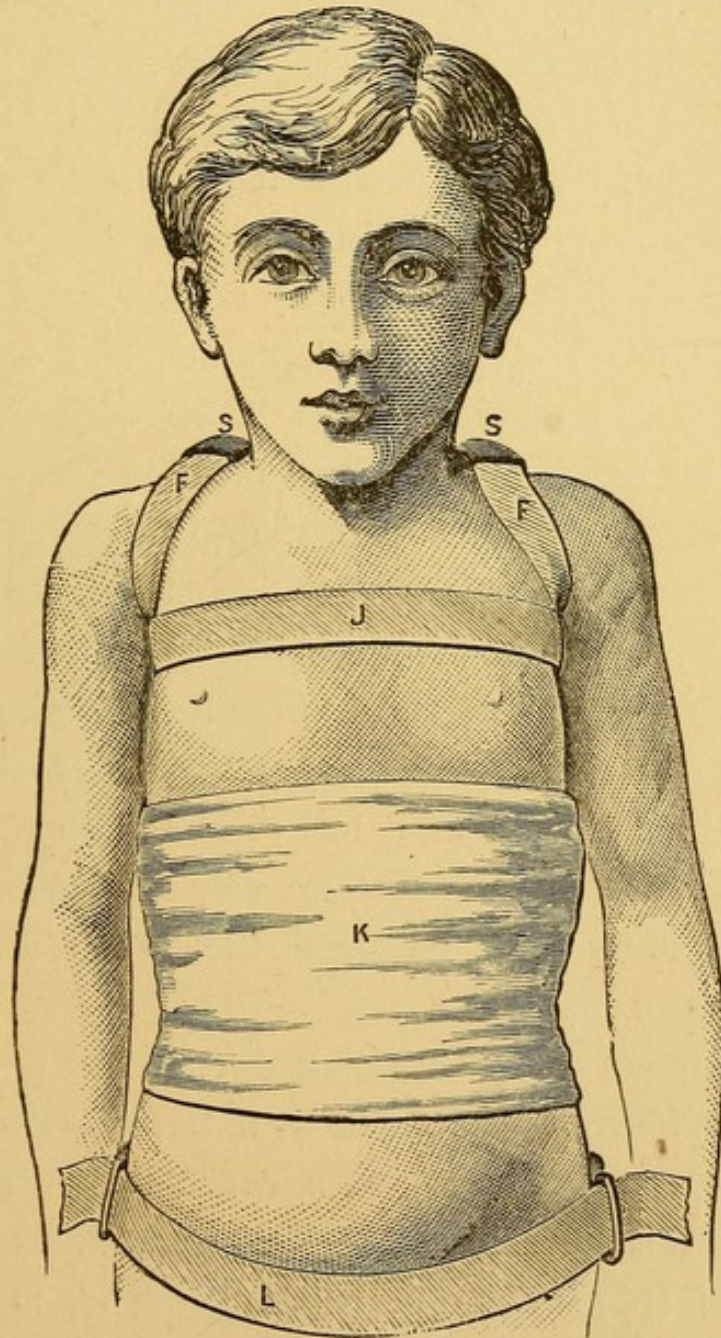


Fig. 2.



force. Taylor's chin piece, acting as a long, superior arm of the lever, affords the best medium, in my own experience, of securing efficient support ;—not by extending the spine, as some have thought ; nor yet by acting as a, strictly speaking, antero-posterior support, as has been advanced by others. Recession of the inferior maxillary occurs if it be used continuously on the latter principle. It has answered best, in my hands, as a simple, but firm and unirritating head rest, limiting the anterior flexion of the head and spine, and removing the greater part of the weight from the vertebral column.

In the third region (the cervical) the mechanical elements again become much easier of adaptation, and some of the best results I have ever witnessed in Pott's disease have been obtained in this region by the use of the chin piece surmounting the two lateral uprights of the antero-posterior support. The objection to the use of a plaster base, simply for the purpose of mounting a "jury mast" upon it, must be evident to any one, when some simple support laced to the body, such as Knight's apparatus, would answer the same purpose and allow also of frequent ablutions. But as it has proved inoperative in my own hands, and as it is not only ugly in appearance, but inflicts unnecessary pain and humiliation upon the patient, I have discarded it.

In the treatment of Pott's disease in the first region, I have found a modification of Taylor's antero-posterior support, secured with a plaster zone, to answer an excellent purpose. This apparatus is pictured in figs. Nos. 1 and 2.

It consists (Fig. 1) of the pelvic band, *A*, to which are riveted two perfectly plain uprights, *B B*, of annealed bar



steel, which uprights extend to the shoulder pieces, *D D*, and are steadied at a point opposite the scapulæ by the cross pieces, *E E*. There are no "pad plates," "hinges" or "screws" about this apparatus at all, and the pads at *C C*, are simple rolls of canton flannel stitched to the uprights by transverse threads, shown in the engraving. *P*, represents the location of the deformity, and *F F F F*, shows the plaster zone securing the uprights in firm contact with the tissues lying over the transverse processes.

Fig. 2 illustrates the anterior appearance of the apparatus. *F F*, are the shoulder straps passing from the ends of the shoulder pieces, *D D* (Fig. 1), to the buckles, *H H*, in Fig. 1. *J*, is a piece of padded webbing crossing the anterior and superior wall of the thorax. It is secured at *G G*, in Fig. 1. *L*, is also a piece of padded webbing, which completes the circumference of the pelvis by fastening at the buckles attached to the pelvic band *A*. (Fig. 1). *K* represents the anterior appearance of the plaster zone.

At *D D*, (Fig. 1) and at *S S*, (Fig. 2) are the shoulder pieces which an eminent Professor of Orthopædic Surgery has spent so many hours in condemning. It is claimed, by him, that they exert a pressure downward upon the tissues underlying them, and thus increase, rather than diminish, the pressure upon the diseased vertebral surfaces. The object to be accomplished by these shoulder pieces, as used by myself, is directly the reverse of that so frequently stated by Dr. Sayre. Properly used, they prevent pressure, and serve as points of attachment for the axillary straps, so that these axillary straps, in passing over the shoulders, shall not exert undue downward pressure. In short, they so modify the pressure of these straps,



that it is exerted antero-posteriorly rather than perpendicularly. Being annealed, these shoulder pieces may be bent in any direction desired; and they should be curved so that a very little space exists between them and the subjacent parts. The pelvic base is sufficient upon which "to hang the apparatus," and it becomes quite frequently necessary to apply perineal pads to prevent the moving upward of the apparatus, rather than to adjust shoulder pieces to keep the appliance from slipping down.

With Figs. 1 and 2 before us, I will attempt to describe the method of applying the plaster zone apparatus to a case of Pott's disease involving the first region.

1st. Take two light bars of annealed steel, of a length which corresponds to the distance between the commencement of the anal commissure and the spinous process of the second dorsal vertebræ. These form the uprights. 2ndly. A piece of sheet steel, about one inch wide and long enough to reach from the top of one trochanter major to the other; bend it to correspond with the transverse sacro-iliac region, and cover with chamois or other soft material. This forms the hip band. 3dly. Two cross pieces, four or five inches long, which are riveted to the uprights at points which correspond to the lower border of the axilla, and the inferior angle of the scapula. 4thly. Two small pieces of light bar-steel about two and a half inches long, which are covered and riveted to the upper end of the uprights at an angle of about  $45^{\circ}$ , and bent as shown in the engraving. Buckles are now attached to the ends of the shoulder pieces, the cross pieces and the pelvic band. The distance between the uprights should be about one inch and



a quarter, or sufficient to avoid any pressure upon the spinous processes. These component parts being riveted together, two rolls of canton flannel about three-eighths of an inch thick and a little wider than the upright bar are now prepared. They should reach from about one inch above the pelvic band to the lower cross-piece. Two broad webbing bands as shown at *J* and *L*, in Fig. 2, are then made ready.\*

We are now prepared to apply the apparatus. To do this we proceed as follows: The patient is placed upon two tables of equal height, and the tables are then separated so that the parts selected for the zone may be freely accessible from all sides. One assistant now grasps the patient under the axillæ, the other makes steady, but easy, traction at the thighs. While the patient is in this position, the operator fits the uprights to the line of the transverse processes; in other words, adjusts the apparatus to the deformity. A pair of "monkey wrenches" may be easily used as a pair of levers with which to bend the annealed steel uprights into *any* position. It takes but a few moments to adapt the uprights to the deformity. In the meantime the patient is quiet. He does not struggle nor cry. The traction is affording relief, and is not producing any injury. While he lies quietly, and the canton flannel pads are sewed on, we pass a piece of canton flannel, or merino gauze, around the body over the projection. Then, the plaster band-

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\* Messrs Tiemann & Co., No. 67 Chatham Street, New York, will furnish this "plaster zone apparatus" at a cost of from \$5.00 to \$7.00, according to size. It would also be well, in sending the measurements to enclose an outline of the spinal column, from the spinous process of the second dorsal down. This may be done by placing a strip of lead along the spinous processes, and moulding it accurately to the outline presented. By transferring this lead carefully to a sheet of paper, an accurate profile of the spine may be obtained with a lead pencil tracing.



ages and everything being in readiness, the apparatus is laid on the back accurately, traction is steadily maintained, the thoracic and pelvic straps are fastened, and the plaster zone is snugly applied. We leave the axillary straps until the plaster is hardened, and the patient is ready to sit up. When the operation is complete, the patient is firmly secured in an apparatus, which affords a support that can be maintained by the thoracic, axillary and pelvic straps, and the uprights are held, without undue pressure, in their position by the plaster zone.

The many advantages of this plan are obvious. The apparatus, as such, is wholly under control of the surgeon, and there are no mysterious "pad-plates," no "cork" or "hard rubber" pads, no screws or "hinges," no "aprons," with many webbing tails, to confuse the uninitiated. It is very simple in its application, and requires no special education to adjust it. There are no opportunities for the deformity to increase, if mechanical means will suffice to control it, for the thoracic, pelvic and axillary straps furnish us with a means of regulating, from time to time, the relation of the superior (thoracic) and inferior (pelvic) portions of the apparatus to the spinal column. If the zone becomes loose, as it almost always does, it may be taken off and an inch, or more, removed from the front. Eyelets may then be inserted, and the zone may be tightly laced, as Sayre does with the jacket. It is a matter of very little trouble to apply a new zone, and patients have no dread whatever of the operation.

On the other hand, the zone allows us to insert the finger under the bridge formed between the two uprights, and explore in the region of the deformity; only a small portion of the



body is occluded, and respiration is not interfered with. There are no "dinner pads," and suspension is wholly avoided. Cleanliness is possible, and the unsteady "apron" of Taylor's apparatus is supplanted by a firm anterior support. The apparatus answers an admirable purpose in cases of spinal caries, accompanied by lordosis. We may sum the matter up in a few words: Manual extension gives the acquired position; the uprights secured by the plaster zone give unvarying support, which can be maintained by the pelvic, thoracic and axillary straps. No excoriations have occurred in the cases thus treated.

This method is especially applicable to chronic spondylitis in the first region (the dorso-lumbar). I have not, as yet, tried it in the superior dorsal. If certain difficulties can be overcome, the plaster zone promises well in this region. As a means of arresting the motion of the ribs, it will also prove of great service, as Sayre points out. Thus far the form of apparatus which has proved most useful in the superior dorsal region, in my hands, has been the antero-posterior support, with the chin piece, and a ball and socket pivot, which I have devised. I will now proceed to describe both the pivot and its application.

Dr. Taylor's chin piece is made to surmount the uprights of his apparatus through the medium of a pivot which slides into a "keeper." This "keeper" is simply riveted transversely to the upper extremities of the uprights. The pivot, acting as a centre upon which the head is supported, requires a very accurate adjustment in order to meet the indications, and when after many trials, the apparatus is apparently nicely fitted, it is found that the position of the head in the chin piece is not



wholly satisfactory, it becomes a matter of great difficulty to change Dr. Taylor's pivot, which simply slides up and down in its keeper, and is made of one piece of steel. This pivot itself cannot be bent nor twisted, except at great risk of breaking it, and to the general practitioner who is not supplied with a large number of duplicates of different angles, a progressive adjustment of the head-piece cannot be made, and this is always necessary in the treatment of cervical or superior dorsal disease. To overcome this difficulty, I devised, for a case which I saw in consultation with Dr. Henry B. Sands, a ball and socket pivot, which is shown in the accompanying engravings, and which, with the upper keeper (C, Fig. 4), represents, as nearly as may be, the atlanto-axoidean articulation.

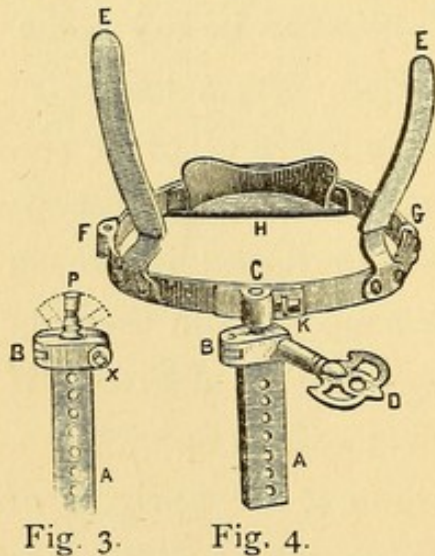


Fig. 3.

Fig. 4.

Fig. 3 shows this ball and socket pivot, the long shaft with holes represents the part which fits into the "keeper." *P*, is the pivot which is inserted in the "keeper" *C*, of the chin piece, (see Fig. 4). The dotted lines in Fig. 3 represent the range of lateral action of the pivot, *P*. The same amount of antero-posterior movement is permitted—indeed, the pivot *P*, may be placed at any desirable acute angle with the base. A clamp holds the ball of the pivot, a hinge at *B*, and a screw at *X*, being the means of securing it. The key *D*, (Fig. 4), operates the screw both at *X* and *K*, which latter will be explained in the description of Fig. 4.



Fig. 4 represents Taylor's chin piece with occipital uprights *E E*, and the form of "chin cup" *H*, I have found the most useful. I have introduced a screw at *K*, by which the head-piece may be secured at any point as it swings laterally on the pivot at *C*. We thus, with the ball and socket pivot, and the screw at *K*, possess the means of securing the head in any position desired, and of changing it at will *without removing the apparatus from the patient*. In Pott's disease or torticollis, where a head support is necessary, the apparatus here described, if surmounted on a proper pedestal, answers every indication in a mechanical sense.

In Figs 4 and 5, *F* represents the hinge upon which the anterior half of the chin-piece opens, and *G* is a slide which locks the apparatus after it is applied.

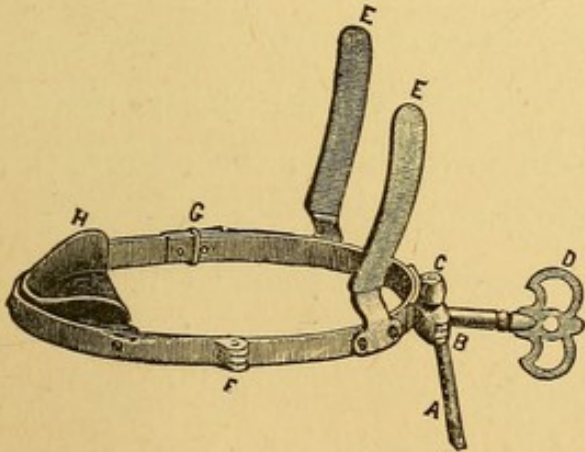


Fig. 5.

Fig. 5 gives a lateral view of the chin-piece, with the occipital uprights, the ball and socket pivot in position, and the key applied through which the various changes are made.

In chronic spondylitis of the cervical region, the plaster base, as I have before stated, is as unnecessary as it is uncomfortable. Still, if it should be deemed best or expedient to use it as a pedestal upon which to surmount a head rest, Dr. Putnam's combination of the plaster jacket with Taylor's



chin-piece \* presents many advantages over the "jury mast." Except that it is cheaper, however, it has no advantages whatever over other and more appropriate pedestals. By running the pad-plates of Taylor's apparatus well up on the uprights and using the shoulder pieces as a basis of support (for here the disease is above the shoulders), I have accomplished many excellent results. The adjustment of the chin-piece is sometimes difficult to the uninitiated, but when once the apparatus is properly fitted there is no other which I have used, that is applicable to this region, which is so complete in its action, or so comfortable to the patient, as Taylor's chin-piece with the ball and socket pivot.

I have deemed it proper, in closing my remarks, to select from my case-books a few illustrations of the results that have been obtained by the use of the antero-posterior support. During the year 1877, out of 299 cases of Pott's disease treated in my service at the N. Y. Orthopædic Dispensary, sixteen were discharged as *cured*. Each case was under observation for several months, *without apparatus*, before it was so discharged. So far as I know, none of these patients have had any return of symptoms and there has been no increase of deformity. With a few exceptions, every case has been seen during the present year. Forty-four of these 299 were discharged as *relieved*—which means that, while all of them have been very greatly benefited, many of them, I doubt not, *cured*, I cannot speak with sufficient positiveness regarding their condition to call them, as I have the others, *absolutely cured*;

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\* Taylor's Apparatus for Pott's Disease in the Cervical and upper Dorsal Regions, mounted on the Plaster of Paris Jacket. By Charles P. Putnam, M.D., of Boston. *Archives of Clinical Surgery*, June 15th, 1877.



fourteen were *discharged for neglect*—*i. e.*, they would not give sufficient attention to our instructions to warrant the expenditure of either the time or the material necessary to treat them; two were *incurable*; ten *died*;\* 213 were continued to 1878. Of 267 treated in 1878, eighteen were discharged *cured*, each case again having been watched for many months after the removal of apparatus. With one exception, no symptoms have appeared indicative of any return of the lesion. This one case, suffering a relapse, was a young man with caries sicca in the middle dorsal region. He had worn apparatus three years. A year after its removal, while engaged in a down town dry goods house, he lifted a heavy case of goods. A return of symptoms occurred. He still maintains his position, however, with his apparatus adjusted.—Forty-four, of these 267, were *discharged relieved* after a careful analysis of the cases based upon visitations and examinations, where they could be obtained; six were *discharged for neglect*; and twelve *died*. From these cases, and others occurring in my private practice, I have selected a limited number from those that had not previously been treated by any other method, (except Case IV, treated by recumbency) and which will illustrate the difficulties of treatment, and present average results.

I have selected them with a further view of presenting one or more cases representing the three regions I have described, viz., the *dorso-lumbar*, the *superior dorsal*, and the *cervical*: Case I. represents disease of the second and third cervical; Case II., sixth and seventh cervical and first dorsal; Case III., fourth and fifth dorsal; Case IV., fifth to ninth

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\* The causes of death are recorded on page 24.



dorsal; Case V., eleventh dorsal; Case VI., twelfth dorsal; Case VII., the first lumbar; Case VIII., second and third lumbar. As nearly as may be, therefore, the whole vertebral column is represented in these eight cases. To further duplicate them would be unnecessary, and neither time nor space would permit more on this occasion. All of these cases were treated by the antero-posterior support. The plaster zone has not been in use a sufficient length of time to contribute any permanent results.

Case I. Miss A. C., aged 8 years. Residence Yonkers, N. Y. Chronic spondylitis (*sicca*) involving second and third cervical vertebræ. First examined April 29th, 1876.

*Hereditary history* good. Neither phthisis nor joint disease known in family. Has brothers and sisters all of whom are healthy.

The *early history* of patient develops the fact that during the first three years of her life she had no serious illness. Since that age has had measles, whooping cough, scarlet fever, and diphtheria—the two latter being of recent date. The attack of diphtheria (which was very slight) preceded the development of the neck symptoms, by a few weeks only.

On February 22nd, 1876, patient "seemed to have taken cold." There was no marked onset of the symptoms due to the spondylitis. They came on about this time, commencing "like a cold." They progressed insidiously; the patient being better some days, and worse—much worse—other days. The neck "became troublesome and very stiff sometimes," and very painful, especially upon sudden motion. Occipital neuralgia developed, then ear-ache, accompanied by deafness. Dur-



ing the latter part of March the symptoms became much worse, and the patient consulted Dr. E. C. Seguin, who made a diagnosis of cervical spondylitis and referred the patient to me for an opinion as to her condition. I wholly concurred in the diagnosis of Dr. Seguin, who kindly placed the patient under my care. Upon examination, I found the local symptoms of chronic spondylitis (*sicca*) very marked. The reflex symptoms were very prominent—muscular spasm and pain were excited upon any considerable motion of the head. The normal movements of the head were limited in every direction, especially in rotation, the left sterno-mastoid showing considerable resistance, though the chin was rotated to the same side. The nocturnal osteitic cry had been present and was still a frequent symptom. There was an appreciable thickening in the region of the second and third cervical vertebræ and deep pressure here produced pain.

On May 10th, 1876, the antero-posterior support with chin-piece was applied with relief to the more important subjective symptoms. I have kept very comprehensive notes of this case, which are very interesting. To summarise them I may say that the patient improved steadily—pain upon motion gradually disappearing, the muscular spasm being the last to yield. The patient wore the apparatus without any discomfort and could run and play like other girls of her age, during the whole of the treatment. The entire apparatus, including the chin-piece, with occipital uprights, was also worn at night without any complaint after the first week. Patient improved markedly in every way physically while wearing the apparatus, and the relief from pain was great.



Patient was *discharged as cured* November 17th, 1877. Her general condition then was excellent. The local condition was as follows : There was *slight* limitation of motion in extreme rotation of head to the right, which limitation was not perceptible unless the shoulders were firmly held, and the movement compared with the opposite one. The resistance was not due to any muscular spasm or contraction, but to changes which had taken place in the vertebræ. The thickening in the upper cervical region was still present, but could be detected upon digital examination only. I have seen the patient several times since apparatus was removed, and Dr. Seguin examined her at my request one month after the apparatus was removed. At that time Dr. Seguin made the following note, which he has permitted me to copy from his case-book :—" December 17th, 1877. Apparatus removed a few weeks ago. Cure perfect ; patient can bear any motion and flexes the spine well in all directions ; is rosy and fat."

I do not submit outlines of the vertebral column. No change whatever is perceptible at the point of lesion between the one which was taken when the patient was first examined, and the one which illustrates this result. The patient grew an inch and a half during treatment.

*Summary.* Apparent duration of disease prior to treatment, about two months ; length of treatment, eighteen months ; time elapsed since removal of apparatus, sixteen months.

CASE II.—Christina S——, aged 6 years. Admitted to N. Y. Orthopædic Dispensary, August 7th, 1871. Pott's disease ; 6th and 7th cervical and 1st dorsal.

As is the case with many dispensary patients, it was found im-



possible to obtain a reliable family history. There seems to be no record of phthisis, or joint disease, in the immediate family. Other than this nothing could be obtained bearing upon heredity.

Patients *early history* unfavorable. Had a great deal of "sickness" prior to her third year, though the nature of this illness could not be ascertained.

The mother states that the cause of the disease was "many falls out of bed." Six weeks before the patient appeared for treatment, it was noticed that she "walked to one side and stooped forward." This was accompanied by "a pain between the shoulders upon sneezing or any sudden jar." The general condition of the patient is described as unfavorable in the notes, and "there is a prominence at the first dorsal, lateral inclination of head to right side, rigidity of the spinal column at the point of disease, and motion of head limited laterally." Much pain was produced by attempts at motion, especially when the effort was made to carry the head beyond the points at which muscular resistance began.

The antero-posterior support, with chin-piece, was adjusted August 13th, 1871. Excellent support was obtained, and the case progressed favorably and, apparently, very rapidly. A speedy result was anticipated by both the parents and myself. In July, 1872, however, a very severe attack of dysentery occurred, which ultimated in great emaciation, and a return of all the unfavorable symptoms. The recovery of lost ground was extremely slow, and we find entries running through the history, which demonstrate that while the support was excellent, the general condition did not improve. Abscess formed, accom-



panied by much pain, hectic and great debility. The gums became spongy, and bled very easily. Thorough constitutional treatment, and the faithful use of the apparatus, finally conquered, and the patient was discharged cured January 26th, 1877. On February 5th, 1879, Dr. S. A. Foster, senior Assistant Surgeon to the Dispensary, visited the case, and obtained an accurate outline of the spine, over two years after the removal of apparatus. The result is shown in Fig. 6. The site of disease is shown at x; the dark line showing the outline as taken by myself when the case first presented for treatment; the dotted line, the result as taken by Dr Foster.

*Summary.*—Apparent duration of disease prior to treatment, indefinite; many months. Length of treatment, about five and a-half years. Time elapsed since removal of apparatus, over two years.

CASE III.—R. R., aged 6 years, resides in Morrisania, N. Y. Examined Jan. 5th, 1870. Pott's disease, 4th and 5th dorsal.

*Hereditary history,* good. Has healthy parents. No phthisis or articular disease known among ancestry, which can be traced back through two generations.

The *early history* of patient develops the fact that he had "a very severe inflammation of the bowels" during infancy; and that an attack of diphtheria, also very severe in character occurred shortly before the development of the first symptoms traceable to the vertebral lesion. Has two brothers and two sisters—all in apparent good health. Patient never had any fall or injury other than those which ordinarily occur to boys of his age.

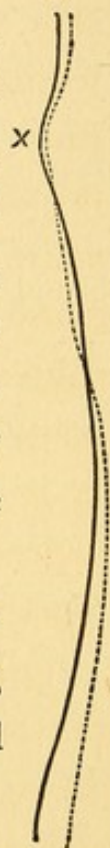


Fig. 6.



*Examination.* Patient a fairly nourished lad, broad-shouldered and of good frame. Has a peculiar brownish tint to skin, which is not localized, nor hereditary. An evident projection in the middle dorsal region. The mother assigns no cause for the disease. The first symptom noticed was "a peculiarly sharp cry at night, occurring during sleep." The cause of this cry was inexplicable to the parents and several consultations with physicians did not throw any light upon the subject. At length, many weeks after the nocturnal cry, "a lump was seen in the back." Pain could be easily produced by any sudden jar—even if it were slight. Attitude and facial expression alike expressed suspense and profound distress. Nocturnal cry still present.

The antero-posterior support was applied a day or two after the examination. The lesion was situated in that region of the spine, where great difficulties present in the way of giving adequate support. The anterior and superior wall of the thorax, and the axillæ, not affording sufficient counter-pressure, the chin-piece was added. The relief was marked.

This case—a typical one, in some respects, of *caries sicca vertebralis*,—I had the opportunity of following very closely, and the mother made an excellent and attentive nurse. At the end of six months all the subjective symptoms were absent, and, as I remarked at the time, many surgeons might have considered the case cured. Some four months subsequently, however, a slight injury again developed the latent symptoms. To be brief, the support was worn until January, 1877—just seven years. During the last two years of treatment, however, the chin-piece was removed, and the apparatus was worn as a matter of precaution only.



The result is shown in Fig. 7. The dark line illustrates the outline of the spine in January 1870—before apparatus was applied,—the dotted line shows the deformity as it appeared on February 9th, 1879. Both outlines were taken by myself.

*Summary.* Apparent duration of disease before treatment,—several months—a year or longer. Length of treatment, seven years. Time elapsed since removal of apparatus, twenty-seven months.

Case IV. Anna H—, aged 20 years. Residence Brooklyn. Admitted to New York Orthopædic Dispensary, July 26th, 1872. Diagnosis; Pott's disease,—5th to 9th dorsal.

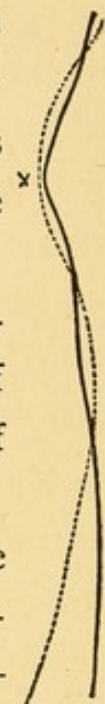


Fig. 7.

*Hereditary history.* Father died when patient was 10 years old; cause not known. Mother living in Ireland. Patient has had four brothers and four sisters; two of these brothers are living and are in good health; one died in infancy, the other recently of "hasty consumption." Two of the sisters also are dead; one in infancy, the other from puerperal fever. The others are well.

The *early history* of patient shows nothing noteworthy, as related by herself. Had measles when a baby. Several attacks of "fever and ague" and "rheumatism" occurred shortly before the disease of the spine manifested itself.

The history of the development of the spinal lesion is very indefinite as to the early symptoms. The first symptom which the patient herself noticed was a pain in the right side—which pain was especially aggravated in stooping, lifting heavy articles, or sweeping. This was "some time



in 1870." No projection had been discovered by the patient or her friends, at that time. About seven or eight months after the pain appeared the patient began to limp. Then it was that the projection was noticed. \* The limp proved to be a premonitory symptom of a progressive paraplegia—which became complete at the end of about twelve months. The left lower extremity became paralyzed first, the right three or four months later. Among the symptoms noticed, which either came before the limp above referred to, or were coincident with it, was a "numbness and a pricking sensation" and an inability to walk with the eyes closed. The patient could not tell at this time "where her legs were, when she was lying down in the dark." In the meantime the projection became larger, and when the paralysis had become complete the deformity was "about as large as a chestnut." Partial paralysis of the bladder and rectum also occurred. In 1871 (May 11th) patient entered a Brooklyn hospital, completely paralyzed. She was treated by the recumbent position for thirteen months, the spinal curvature increasing very much in the meantime. Slight bed sores developed over the spinous processes and sacrum—which yielded to careful treatment. Patient left the hospital on June 19th, 1872, utterly unable to move her lower extremities. A week after the patient had left the hospital I saw her in Brooklyn. I found a very marked deformity. There was at that time complete paralysis of the lower extremities; the rectum and bladder also were partially paralyzed; marked anæsthesia, especially of the left leg. Slight titillation of the soles of the feet produced marked and prolonged "reflex trembling." The adductors of the thigh were very tensely



contracted, the knees were extended, and the entire lower extremity on either side was stiff and unyielding, except upon the application of great force. The knees were held closely in contact, and incipient sloughs were appearing as the result of the pressure. Patient's general health good.

In September, 1872, the patient was, at my suggestion, removed to this city and placed in a private boarding-house—the late Mr. Theodore Roosevelt kindly agreeing to meet all necessary expenses incurred in pursuing this plan. Her symptoms then were much the same as above described, aggravated, if anything, by undue attempts to sit up, and the journey from Brooklyn. An antero-posterior support was applied, the patient, of course, keeping the recumbent position. By these means, recumbency and the use of apparatus, the vertebral column was practically immobilized. In two weeks after the application of the splint sensation began to return to the lower extremities. In six weeks she was able to stand alone, and in nine months the paraplegia had entirely disappeared. The patient continued under my care for several years, and wore the apparatus (without the chin-piece) as a matter of precaution until May 1st, 1877, when she was discharged, cured. Since that time she has been engaged as nurse, and has done much heavy lifting without any inconvenience or return of symptoms.

The original outline of the deformity is shown in Fig. 8. It was taken by myself in 1872, before treatment was commenced. When I last saw the patient, for some unexplained cause, she objected to having an outline taken of the result. The original "pattern" placed over the projection, however,



showed a slight increase of the deformity. There was an increased incurvation—a lordosis—of the spinal column at the point *o*. Otherwise the projection was practically the same as shown in the figure.

*Summary.*—Apparent duration of disease before treatment, not definitely stated; several months. Length of treatment, nearly five years. Time elapsed since removal of apparatus, twenty-two months.

I have seen too many cases in the condition above described improve under similar circumstances, after an accurately fitting support was adjusted, to regard the improvement in this case as simply co-incidental with the application of apparatus. Among many others, I may mention the case of an adult male in the surgical ward of Roosevelt Hospital, who was similarly affected. At the request of Drs. H. B. Sands and R. F. Weir, I applied a comprehensive antero-posterior support to the patient. The improvement was very rapid and permanent. I have another case now under observation in my service at St. Luke's Hospital, (Jane McG., aged 47,) whose case in many important particulars resembles that of Anna H. The recovery from the paraplegia has been very slow, however, and the patient altogether has passed three years in bed, wearing an antero-posterior support. She is now well, but still wears an apparatus. The case of Mr. M., aged 45, who remained for several years in the Orthopædic Hospital, will also illustrate the advantages of the combined recumbent position and the antero-posterior support. This



Fig. 8.



case, one of the most severe and protracted I have ever seen (the lesion at one time threatened the life of the patient) was seen several times in consultation by Dr. E. C. Seguin. The paraplegia was complete. The condition of this patient when he left the hospital was such that, in the recumbent position, he could voluntarily execute any movement with his lower extremities. It was a question of a few weeks only as to how soon he would be permitted to stand alone. He passed into the hands of a prominent surgeon after leaving the Orthopædic Hospital, and was soon "cured" by the plaster jacket. I could refer to several others, some of which are as interesting as those I have already referred to. I have mentioned only adults. I could report very many cases occurring among children, where the paraplegia of Pott's disease was very speedily relieved by the antero-posterior support, after simple recumbency had failed.

CASE V.—F. J. R., aged 5 years; resides in New York City. Admitted to N. Y. Orthopædic Dispensary May 16th, 1877. Diagnosis, Pott's disease, 11th dorsal.

*Hereditary history* very unfavorable. Mother died of phthisis. Four other children, brothers or sisters of patient, have died at an early age, and one now living is "very delicate." "Hereditary lung trouble on mother's side," several members of the family dying shortly after puberty of "hasty consumption."

The patient was "apparently healthy" as a baby; dentition easy; no serious illness. About March 1st, 1877 (or two months before he was brought to the Dispensary) he was "noticed to walk sideways." He also "bent forward, and supported himself by placing his hands on his knees." Was



treated for hip disease, with weight and pully, by a Brooklyn physician.

At the time he applied for treatment, the patient seemed fairly nourished, though he was very pale and apprehensive. Slight movements of the spine produced pain. There was flexion of the thigh on the left side due, probably, to the presence of pus, though no other sign of suppuration could be detected. The deformity was very slight, though the posterior curvature was greatly exaggerated by a general excurvation of the whole vertebral column. (See Fig. 9). No cause was assigned, by the father, for the disease. There had been a fall two years before the first manifestations of the spinal lesion, but no connection could be traced between it and the development of the symptoms. Has had "whooping cough, bronchitis and chicken-pox."

On May 24th, the antero-posterior support was applied, followed by the usual marked relief. On June 11th, "a large abscess has formed and is pointing just below the posterior, superior spinous process of the ilium, left side." June 25th, "abscess has opened spontaneously and is discharging a thin pus." The abscess continued to discharge very profusely for several weeks, when the discharge diminished and it became thicker and more like laudable pus. On April 4th, 1878, the abscess had wholly closed. It has remained so ever since. There has been a very slight increase of the deformity due to the lesion, while the great, posterior curvature has been wholly overcome. This is a case where an *apparent* reduction of the deformity occurred. But a glance at the two outlines will demonstrate that it is not real. The excurvation of the spine has been overcome, but the actual curvature due to the disease has really increased. The



antero-posterior support accomplished in this case, what suspension does, viz., it modified the apparent curvature without affecting that due to the lesion.

This boy is perfectly well, and has been in a condition to have the apparatus removed, for many months. The father of the patient, however, has preferred to keep it applied, though I directed its removal in November, 1878. It was finally taken off about February 15th, 1879.

The dark line in Fig. 9 represents the profile of the vertebral column when patient was first examined. The dotted line shows the result.

*Summary.*—Apparent duration of disease before treatment was commenced, about two months. Length of treatment, about eighteen months. Time elapsed since apparatus was removed, about two months.

CASE VI.—M. S., aged 4 years. Residence Brooklyn. Admitted to Orthopædic Dispensary November 16th, 1876. Pott's disease, twelfth dorsal.

Patient's grandparents on both sides lived to be old; no phthisis or articular disease known in family history. Both parents living and in good health, apparently. Has one brother living; one sister died at sixteen months, cause not stated, other than "general weakness."

When the patient was five months old she had a severe attack of diarrhœa, which continued for eighteen months. Notwithstanding this, she passed through her dentition easily. She recovered from the immediate effects of the diarrhœa, for at three years of age, the patient "was apparently as healthy as any child of similar age."

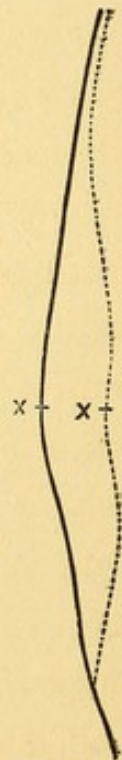


Fig. 9.



About one year before patient applied to the Dispensary, her parents noticed that she had a peculiar gait; she would fall easily, and get up with great difficulty. Had great pain whenever she fell, or when suddenly lifted. No cause was assigned for the disease by the parents. There was no history of any fall or blow, "no injury of any kind." The patient was in an apparently good condition, when she applied for treatment. An evident projection existed at the twelfth dorsal, pain could be easily excited by sudden and unexpected movements of the vertebral column, and the rigid spine, that gives the Pott's disease patient his peculiar attitude, was very marked.

On November 21st, 1876, the spinal support was applied, with the immediate effect of relieving the pain, improving the attitude, and modifying the apprehensive gait. The patient improved rapidly in every way under the mechanical and constitutional treatment. The patient came to the Dispensary with a fair degree of regularity until May 6th, 1878, when we find the record, "doing excellently well. The patient not returning for many months, a letter was sent requesting attendance on November 2nd, 1878. Two days later the patient called when, after examination, she was discharged, cured. The patient has been recently examined. No increase of deformity since apparatus was removed.

The dark line in Fig. 10 shows the outline of the spine when patient first applied for treatment, November 16th, 1876. The dotted line shows the result as taken November 4th, 1878. It will be observed that there is an evident decrease of the deformity, and that the normal curves of the spine are obliterated. From the seventh cervical to the sacrum the line is nearly a



straight one. The vertebral column is rigid in the immediate region of the deformity.

There is no doubt in my mind that had this patient reported with regularity to the Dispensary, she would have been discharged, cured, much sooner.

*Summary.*—Apparent duration of disease before treatment was commenced, at least one year. Length of treatment, two years. Time elapsed since apparatus was removed, five months.

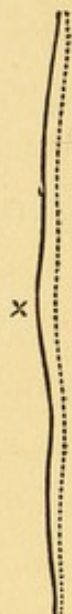
CASE VII.—R. E., aged five years. Residence, New York City. Dispensary. Diagnosis, Pott's disease. First lumbar. Admitted March 7th, 1870.

Fig. 10.

There is nothing of interest in the boy's hereditary history. The parents are Germans, free from any appearance of disease or debility. The remote history cannot be obtained. Patient has four brothers and one sister. They are well. Relatives, "all are healthy." The patient himself was "in seeming good health" when he first applied for treatment.

Patient "fell from a girl's arms, as she was swinging him at arm's length" in October, 1869. Soon after "he was taken to a doctor for a pain in the stomach." In January, 1870, projection was first noticed. It progressed until it appeared, on the occasion of our first examination, as shown in the dark line of Fig. 11.

On March 11th, 1870, the patient came to the Dispensary for his apparatus, walking badly. Has suffered much pain night and day. The antero-posterior support was applied, with marked relief. Several entries in the history show that the patient steadily improved until May 16th, 1870, when the





relief afforded by the apparatus gave the patient so much confidence, that he became too active, running and jumping like other lads. Ordinary exercises are always permitted with a suitable support in Pott's disease; but extraordinary or violent exercises are not advisable, be the support what it may. Our "caution regarding too violent exercises," (May 30th, 1870) was not heeded. In addition to this he became negligent regarding his attendance, but "wore his brace constantly." He came for observation very rarely during the summer of 1870.

On September 16th, there was made this entry: "Ascertained that patient had a very bad fall two weeks ago." We feared the return of pain; but October 19th, there is recorded, "No unfavorable symptoms." We finally lost sight of the patient for two years or more; but he wore his apparatus steadily, and his mother kept it in repair.

On February 16th, 1876, this entry occurs: "Patient doing well; came for repairs to brace." Another long absence occurs, after a few visits for repairs, when we found the following record under date of June 1st, 1877: "Was to-day examined and pronounced cured. Apparatus removed."

The history and progress of this case illustrate how much may be accomplished under adverse circumstances, with apparatus acting upon correct principles, and constantly worn. Once accurately fitted to a deformity occurring in the dorso-lumbar region, the antero-posterior splint does not need many changes, and an intelligent mother, in a case like this one, may, with occasional consultations, conduct the mechanical treatment with success. The advantages of this method of pro-



cedure in private practice over the constant renewals of plaster jackets, must be obvious to those who have followed both methods conscientiously.

In this case the apparatus was worn a long time. Had he been attentive to our instructions, I do not doubt it would have been shortened fully one-half.

I have seen the patient many times since the removal of the apparatus. There has been no return of the symptoms. The boy is now over 14, and is engaged as a clerk in a grocery store.

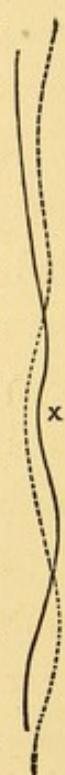
The dark line in Fig. 11 shows the outline of the spine on March 7th, 1870; the dotted line the result. The latter tracing was taken June 1st, 1877. The increase of deformity is quite apparent. There has been no increase since removal of apparatus.

*Summary.*—Apparent duration of disease before treatment, about six months. Length of treatment, seven years. Time elapsed since removal of apparatus, twenty months.

CASE VIII.—T. F., aged 10 years. Residence, Brooklyn. Admitted to Orthopædic Dispensary July, 1874. Diagnosis, Fig. Pott's disease; 2nd and 3d lumbar. Patient referred to the II. Dispensary by Dr. Pilcher, of Brooklyn.

Hereditary history very unreliable. Very little ascertained of father's family. No phthisis nor joint disease known in mother's family. Patient has two brothers; one "quite delicate." Has had three sisters; one is living, "in good health;" two have died; cause not known.

Patient had whooping cough and scarlet fever during infancy, otherwise has been "healthy" since birth.





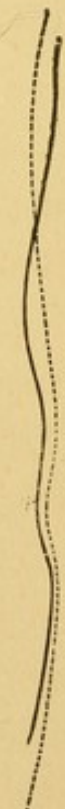
The cause of disease was stated by the mother of patient to be "a fall down stairs." We were unable, however, to ascertain just when the fall occurred, or how the patient traced the connection between the disease and the injury.

The first symptom which really attracted the attention of the parents was the deformity. After this had been discovered, it was remarked that the patient had been "pining away" for some time, and had experienced some "pain in the back and stomach" for several months.

In July, 1874, (the exact date is missing), the antero-posterior support was applied. Patient proved to be a very irregular attendant. He came with sufficient frequency however, to have an adequate support maintained. Patients themselves can easily tell when an apparatus fails to give sufficient pressure. The apparatus was broken several times, and as many times repaired.

The patient last visited the Dispensary, wearing the apparatus, in August, 1877. He was visited by one of the Dispensary staff on December 22nd of the same year, when the apparatus was removed and the patient was discharged cured. At my request he visited the Dispensary, November 4th, 1878. It was found that there had been no increase in the deformity since his discharge. There were no evidences whatever of disease about the boy, except the arrested deformity.

The dark line in Fig. 12, shows the profile of the spinal column at the first examination of the patient in July, 1874. The improved outline is seen in the dotted line. Still, I doubt, if the real projection has diminished any, *Fig. 12*





though others might so claim. The superior, compensatory curvature has been modified.

*Summary.*—Apparent duration of disease before treatment was commenced, indefinite—“several months.” Length of treatment, three years and five months. Time elapsed since removal of apparatus, fifteen months.

THE END.



The first of these is the fact that the present composition  
 of the atmosphere has been modified.  
 The second is the fact that the present composition  
 of the atmosphere has been modified.  
 The third is the fact that the present composition  
 of the atmosphere has been modified.  
 The fourth is the fact that the present composition  
 of the atmosphere has been modified.

THE END



