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**Contributors**

Whitman, Royal, 1857-

Saxe, G. A. De Santos 1876-1911.

Wolbarst, Abraham L. 1872-

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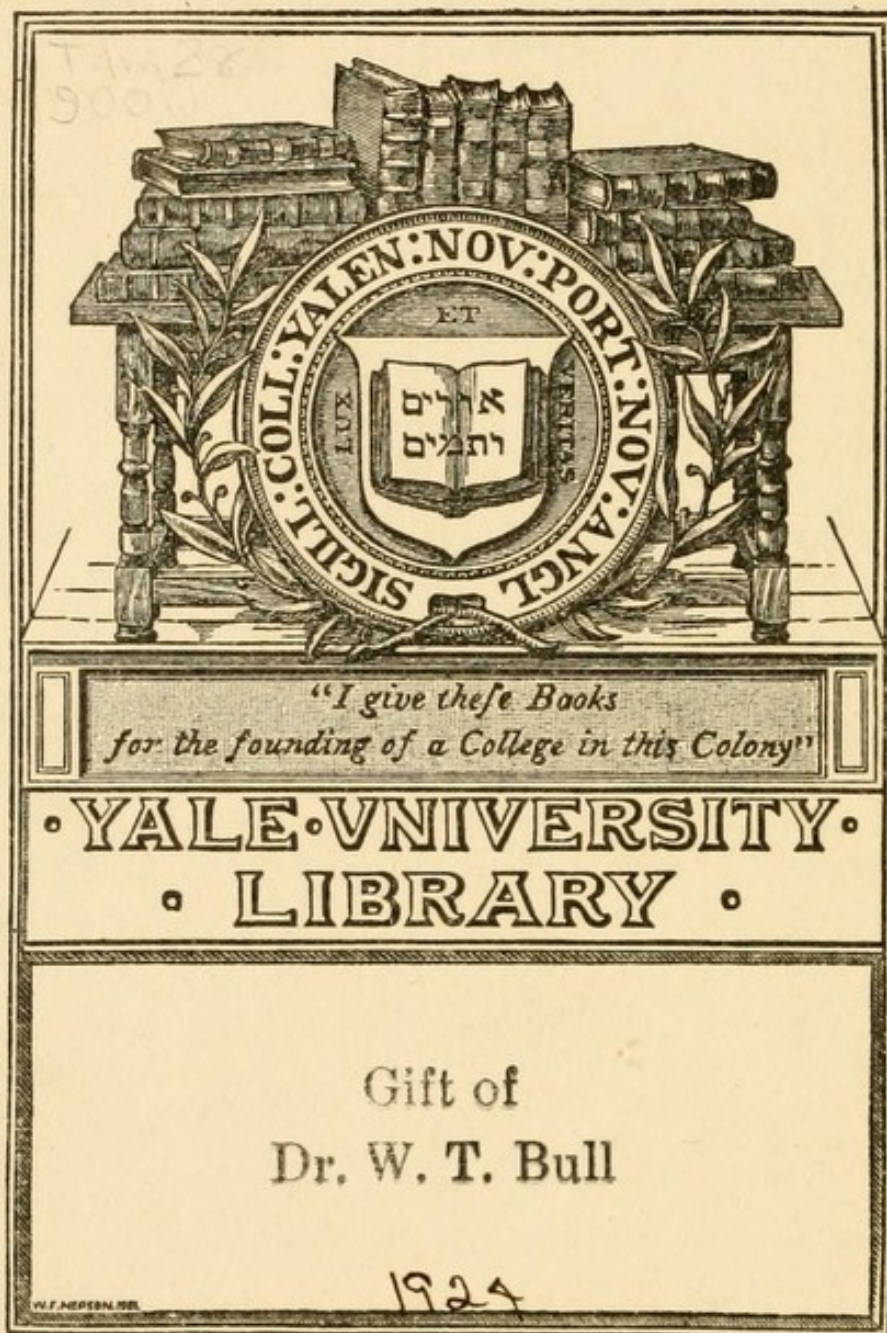
ORTHOPÆDIC SURGERY

WHITMAN

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EDITED BY

SAXE AND WOLBARST



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CLINICAL LESSONS  
IN  
ORTHOPÆDIC SURGERY

BY

ROYAL WHITMAN, M. D.,

INSTRUCTOR IN ORTHOPÆDIC SURGERY AT THE COLLEGE OF PHYSICIANS  
AND SURGEONS OF COLUMBIA UNIVERSITY.

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*EDITED BY*

GEORGE ALEXANDER SAXE, M. D.,

AND

ABRAHAM L. WOLBARST, M. D.

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1900

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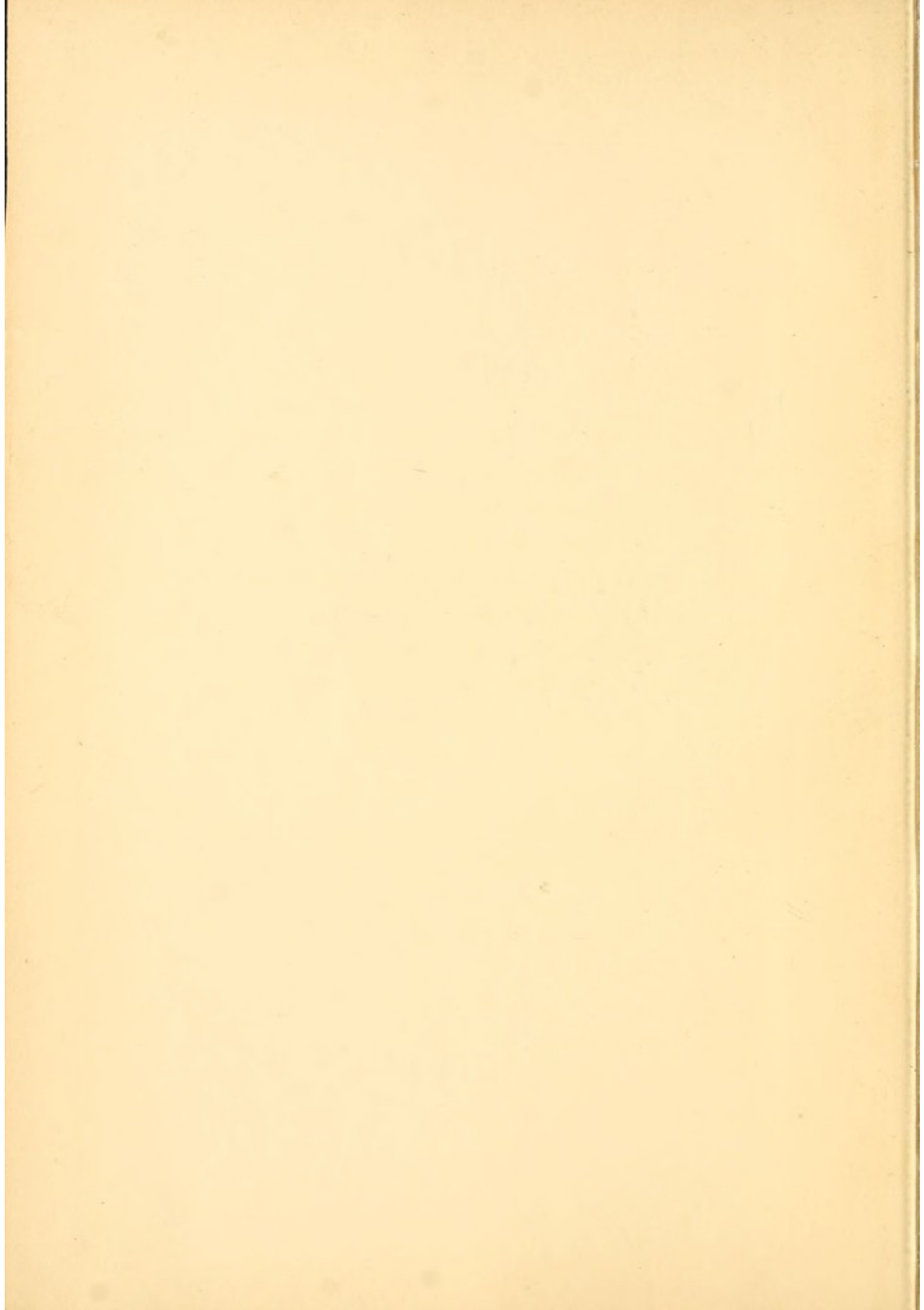
*Gift of Dr. W. T. Bull*

TO  
THE STUDENTS  
OF THE  
COLLEGE OF PHYSICIANS AND SURGEONS  
OF  
COLUMBIA UNIVERSITY

THIS LITTLE VOLUME IS INSCRIBED

BY  
THE EDITORS.





## PREFACE.

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For a number of years it has been the custom of many teachers in our academic colleges to furnish their students with what may be termed a "course text-book." Such a book is written with special reference to the wants of a particular class of students and to the requirements of a definite course of study.

The helpful influence which such manuals exercise upon both instructor and student has not, in our opinion, been sufficiently recognized by medical teachers.

A realization of the difficulties which a student encounters when he endeavors to build up a systematized conception of such a theme as orthopædics, by collating the mass of facts which are presented to him in a course of clinical demonstrations, has impelled the editors to urge Dr. Whitman to give his consent to the publication of this little book.

The preparation of the text was based upon a set of memoranda furnished by Dr. Whitman, supplemented by notes taken by the editors at his clinical lectures and demonstrations, given at Columbia University during

the academic year 1897-1898. A final revision has been made by Dr. Whitman.

The instruction in orthopædics at Columbia University comprises a course of clinical lectures by Professor Gibney, and a course of section-teaching at the Vanderbilt Clinic by Dr. Whitman. This book is meant to serve as a guide to both of these courses, and has therefore been interleaved for additional notes.

Such then is the *raison d'être* and the origin of this little volume. It is intended to be an adjunct to personal teaching and clinical observation. A series of suggestive questions, such as are asked in the clinic by the instructor, have been placed in the margin. Their purpose is to test the student's conception of cause and effect, than which there is nothing more essential to the mastery of any subject. A certain number of these questions relate to anatomic, physiologic and pathologic facts, a knowledge of which is necessary to a proper apprehension of the principles of diagnosis and treatment. Upon these the student may with advantage refresh his memory in connection with the study of deformities.

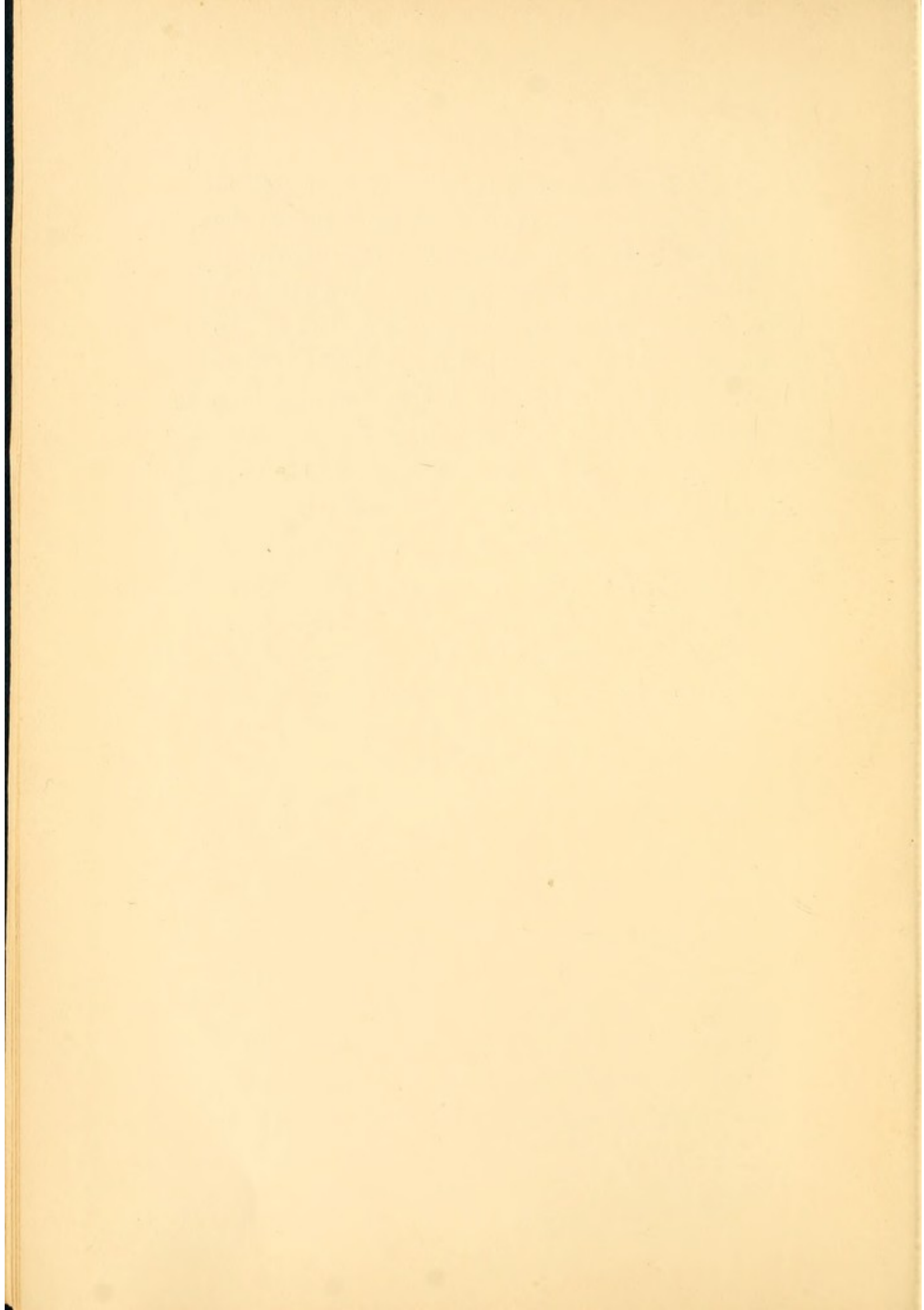
A few of the more important subjects have been considered at some length. Of the larger number only the general characteristics have been described. The principles of treatment have been indicated, but their application has been reserved for actual demonstration.

We have made but little use of Dr. Whitman's exten-

sive collection of photographs of cases, because we did not wish to increase the price of the book beyond the limit. Thus, only about one-third of the illustrations are original, the rest being borrowed. We take this opportunity to express our obligations to Drs. Dillon Brown, Reginald H. Sayre and A. B. Judson, and to Messrs. D. Appleton & Co., W. F. Ford & Co. and John Reynders & Co. for the loan of electrotypes.

THE EDITORS.

New York, January, 1900.



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Orthopaedic surgery concerns  
itself with the

prevention  
+  
correction } of deformity,

congenital or acquired,  
by timely treatment which  
emphasizes its first great  
~~principle~~<sup>aim</sup> to wit (1) early  
diagnosis (2) and includes  
an intelligent application of  
the principles of

mechanical } procedure  
+  
operation }

and general hygienic measures.

# I. INTRODUCTION.

1. Definition and Scope of Orthopædics. 2. General Considerations concerning Etiology, Diagnosis and Treatment of Orthopædic Affections.

## I. DEFINITION AND SCOPE OF ORTHOPÆDICS.

The human body may be considered as an animated machine. As such it is subject to the mechanical laws which govern inanimate machines, although it differs from the latter in its capacity for self-repair and in its power of adaptation to the effects of injury, disease and deformity.\*

The student of orthopædics is especially concerned with the mechanics of the body, with the deformities of its bony framework, with the distortions of its members, and with those diseases of the bones, joints, muscles, or nerves that may lead to deformity, or that may interfere with the functions of locomotion. He should familiarize himself with the anatomic structure of the machine, with its appearance and its functional capacity at different ages and under varying circumstances, with the character of the diseases and injuries to which it is liable, and with their immediate and ultimate effects.

---

\* Whitman—A Definition of the Scope of Orthopædic Surgery, *New York Medical Journal*, June 20, 1896.

By far the greater number of orthopædic patients are young children, and at this susceptible period of life permanent deformity may result from slight causes, if neglected, while cure may be easily attained by timely treatment. This fact is emphasized by the derivation of the word orthopædic from the Greek words **orthos**, straight, and **pais**, child. It was first used by Andry in 1741 to signify the art of preventing and correcting defects and deformities in early childhood by simple means.

Many of the diseases that lead to deformity are chronic in character; many of them are hardly amenable to treatment, and cure is often out of the question. The object of orthopædic treatment in such cases is to prevent the greater degree of distortion and disability which is certain if proper measures are neglected.

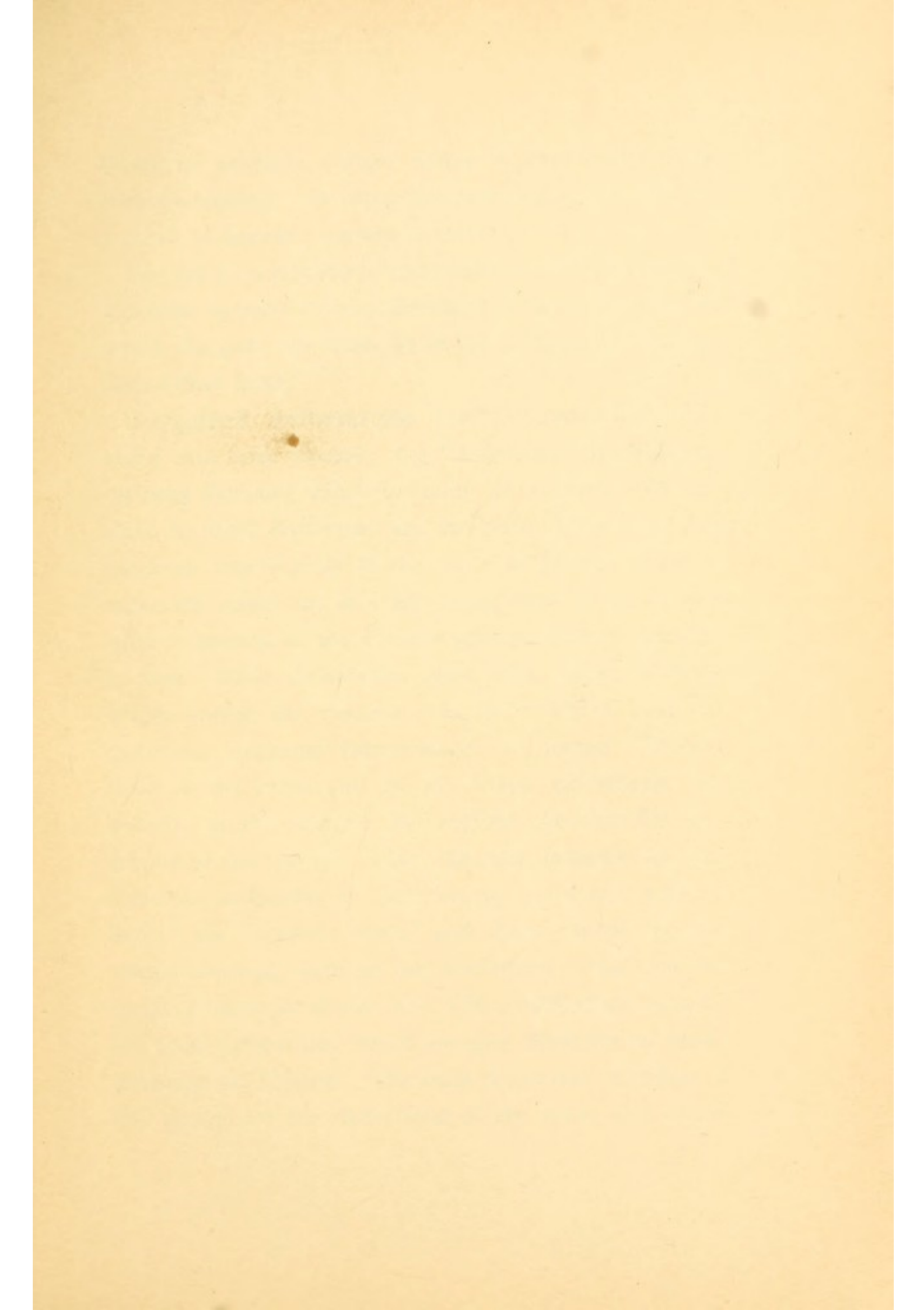
## 2. ETIOLOGY, DIAGNOSIS AND TREATMENT OF ORTHOPÆDIC AFFECTIONS.\*

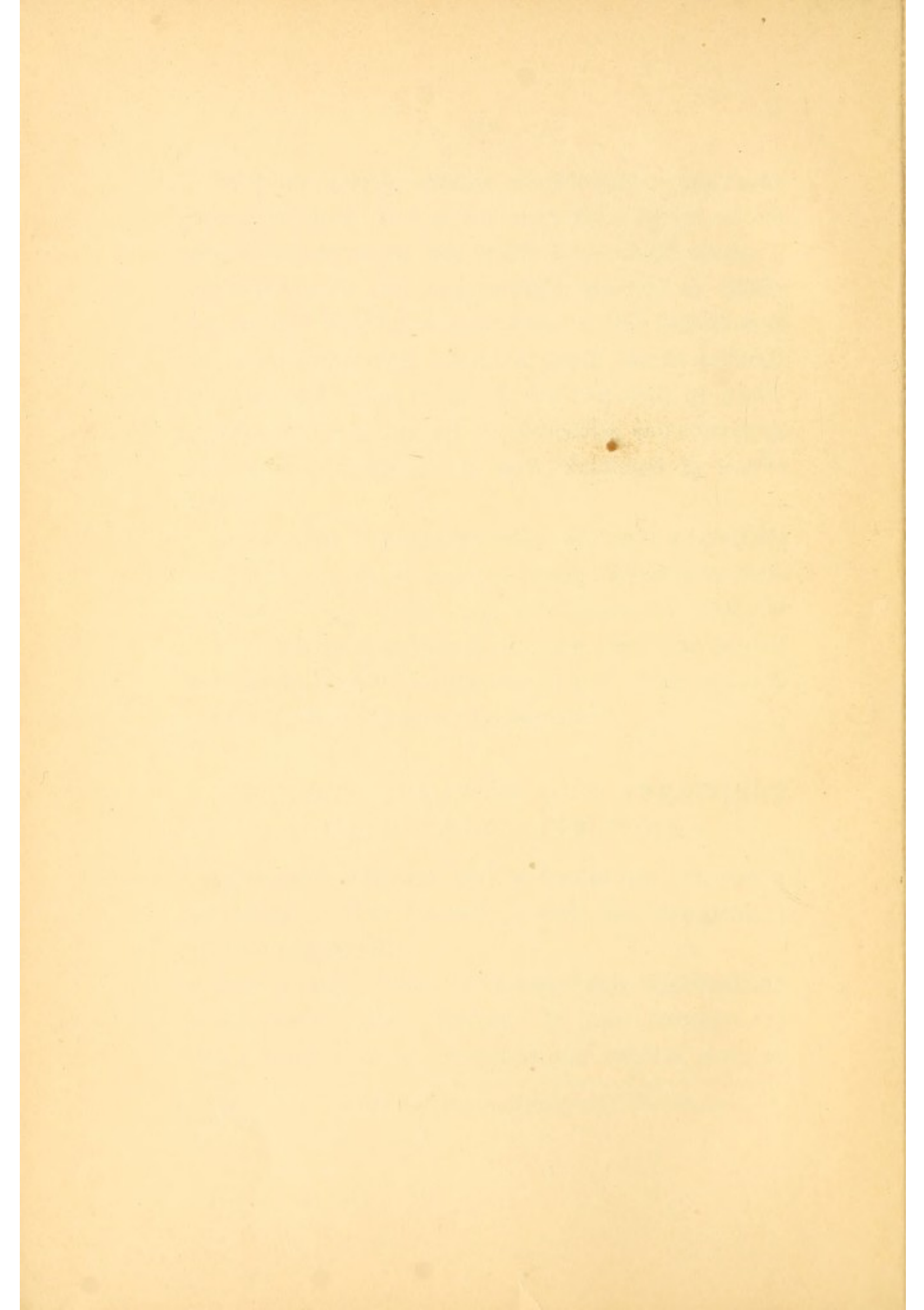
Orthopædic affections may be divided into two classes according to their etiology, namely, the **congenital** and the **acquired**.

The ultimate causes of **congenital deformities** must always remain obscure. In some instances the defect appears to be inherent in the original germ, as

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\* Whitman—"The Ultimate Etiology of Deformity," *The Annals of Surgery*, July, 1896.





when, for example, certain bones or even entire members are lacking. In other instances the defect may be a result of disease or injury in utero.

But the most important and constant cause of such deformities appears to be constrained or faulty attitudes in which the part has been fixed for a longer or shorter time before birth.

**Acquired deformities** may be conveniently divided into three classes: (1) Those **due to general causes** that may affect the body as a whole. In this class the most important are the static deformities, due more or less directly to the force of gravity, which is especially important as a deforming agent in the human subject because of the upright posture which is peculiar to man. Static deformities most often occur in those whose bodies are weakened as the result of impaired nutrition, improper surroundings, or disease. Distortions of the trunk and of the lower extremities, especially those induced by rachitis, are familiar examples of this group. This class also includes the deformities incidental to occupation, as the "weaver's back," the "baker's knee," and those caused by improper clothing, such as the distortions of the toes, the result of improper shoes. (2) The second class includes the local deformities, which are **due directly to local disease or injury**. The most important examples of this group are the distortions of the spine and of the

limbs, caused by tuberculous disease of the joints. Other affections of this class are deformities due to direct injury; the contractions caused by burns, by inflammatory affections of soft parts, or by irritation of the peripheral nerves, as for example torticollis. (3) The third class comprises deformities **due to certain diseases of the nervous system**, of which the distortions caused by anterior polio-myelitis are the most common.

Whatever may have been the primary cause of the disability or deformity, its development and its effects are influenced by many factors, of which functional use and growth in the **faulty attitudes** are the most important. In this connection it may be noted, that although prevention of congenital deformity is obviously impossible, yet under proper conditions cure may be attained in many instances. On the other hand, acquired deformity may be prevented and corrected, but its cause is often of such a nature that cure is out of the question.

Orthopædic surgery deals with matters palpable and measurable, with statics and dynamics, with the locomotive machinery of the body. Thus it is, that in the **diagnosis** of orthopædic affections, the physical signs are of much greater importance than the rational symptoms, although the latter must not be neglected.

The **physical examination** should always include a complete inspection of the naked body, even though







the local deformity which requires treatment is evident. This thorough inspection is necessary in order that one may note the general and secondary effects of the local distortion, or possibly detect other disabilities, deformities, or pathologic foci which may have been overlooked by the patient or his friends. Having thus observed the general condition of the patient, the presence or absence of deformity, of weakness, or of disability, the machine should be put in motion; in other words, the patient should be asked to walk about, in order to test his functional ability. When the patient is in motion, one's attention is drawn almost inevitably to the weak, disabled, or deformed part. A great deal may be accomplished by the student in the way of training his powers of observation in this direction, if he will carefully notice the appearance and attitudes of patients in the clinic, and even of people on the street.

The next step is the inspection of the particular part to which one's attention has been drawn. One should note the size and contour, the presence or absence of heat and local sensitiveness, the color of the skin, and the like, and, finally, one should compare the appearance and functional ability of the suspected part with the normal.

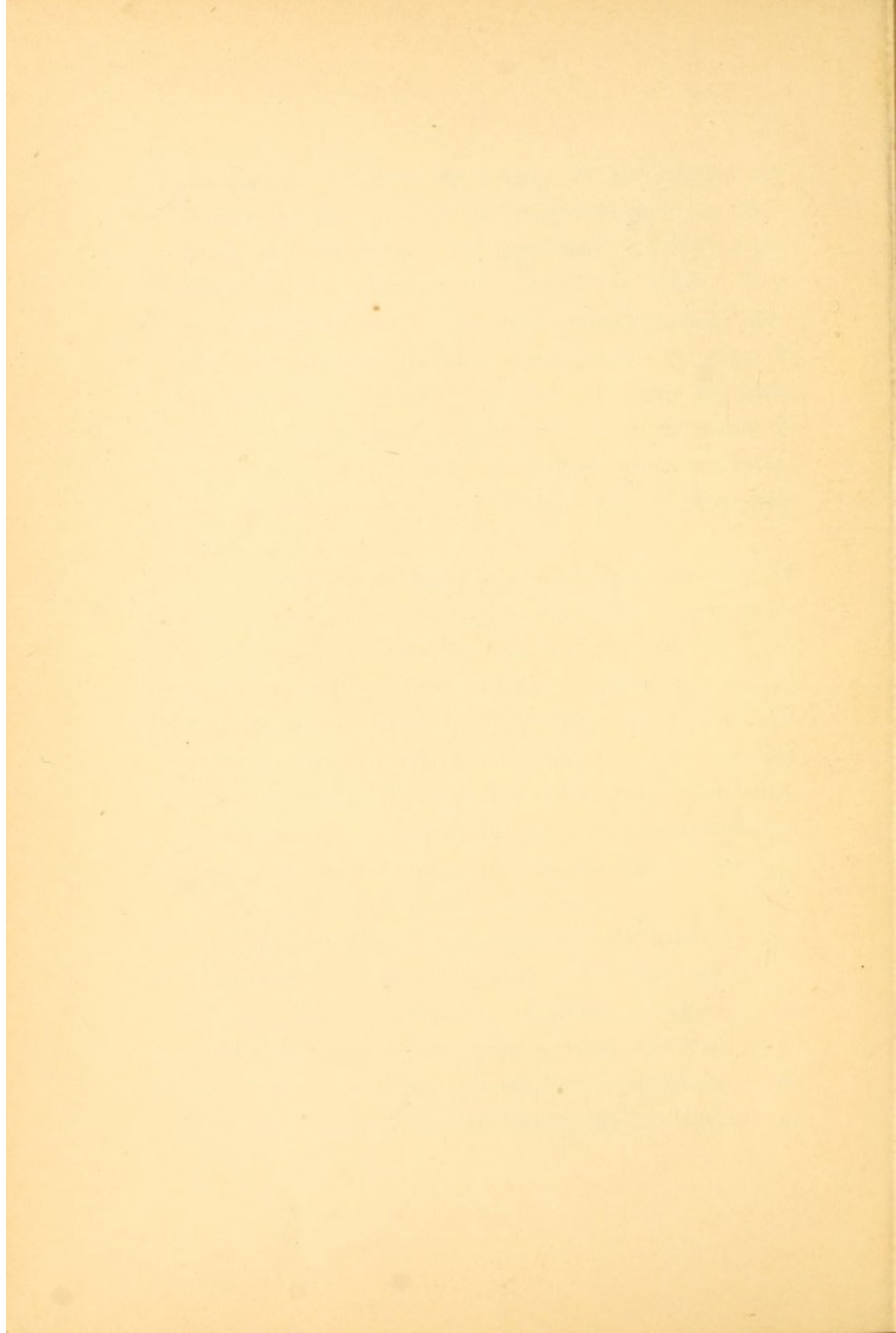
The evidence presented by the physical examination should be supplemented by the **history of the case**, in which the mode of onset and the duration of the

affection are of great importance in determining the character of the disability, the prognosis, and the indications for treatment. An **accurate record** of the results of the examination should be kept. This record should include the exact measurements, and, whenever possible, tracings, photographs, or casts of the deformity. Such a record not only forms the basis on which the treatment is conducted, but is the standard by which its effects may be judged when the question of improvement, and consequently of prognosis, arises.

Orthopædic **treatment** must be adapted not only to the causes of the disability, but also to the age and circumstances of the patient. In its broadest sense it includes the selection of a suitable climate and proper diet, the administration of drugs, the regulation of occupation and of exercise, the employment of massage and of special gymnastics, the correction of deformity, or the removal of disease by operative procedures, and finally the support and correction that may be obtained by the use of mechanical appliances.

In the early days of orthopædics it was generally supposed that the mere application of a supporting or correcting device constituted orthopædic treatment, and even at the present time there are those who limit themselves to the mechanical treatment of deformity. But with the advances in our knowledge of etiology and





pathology, this ultra-mechanical conception of treatment is no longer tenable.

The first essential to an understanding of the principles of treatment is a clear conception of the thing to be treated. Thus one should consider the original cause and the contributing factors that have led to the disability. This disability or deformity should be analyzed by comparison with normal conditions. One may then decide as to what may be accomplished by treatment, and how it may be accomplished with the means at his disposal.

## II. TUBERCULOUS AFFECTIONS.

(1) General Considerations, Etiology, Pathology, and Treatment of Tuberculous Disease of the Bones and Joints. (2) Tuberculosis of the Spine (Pott's Disease).

### I. GENERAL CONSIDERATIONS.

In Orthopædic Surgery, as in general medicine, one of the most important subjects for consideration is tuberculous disease.

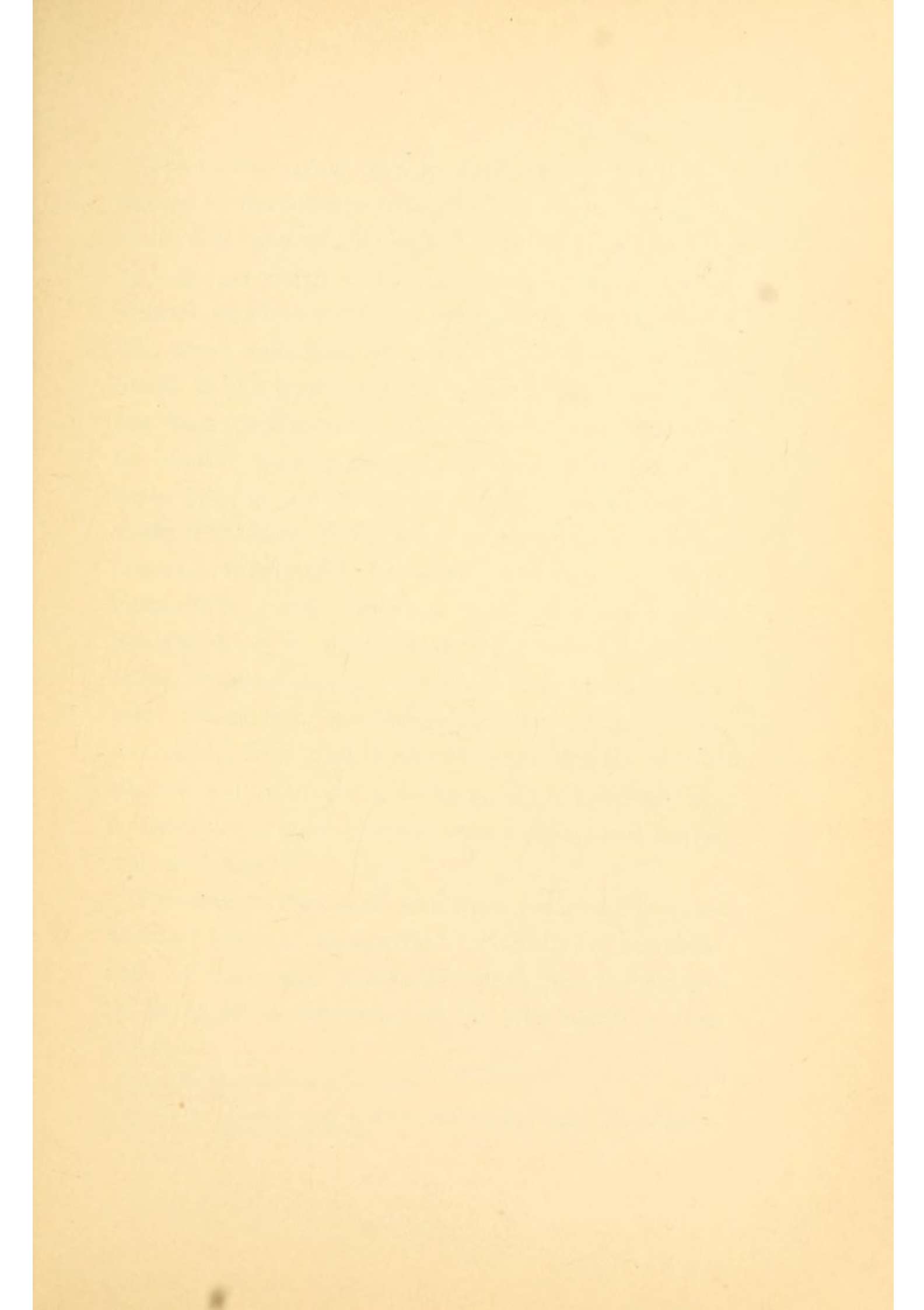
In the etiology of tuberculous disease three factors are to be considered: The infection, the general predisposition of the patient, and the local condition that favors the outbreak of disease in a particular part.

The infectious element is the tubercle bacillus which may gain admission to the body through several channels,\* but most often by means of the respiratory passages, from which it may find lodgment in the bronchial glands. Once in the body, latent tuberculosis is said to be established,—a form of concealed disease that is undoubtedly very common among individuals of apparently perfect health.

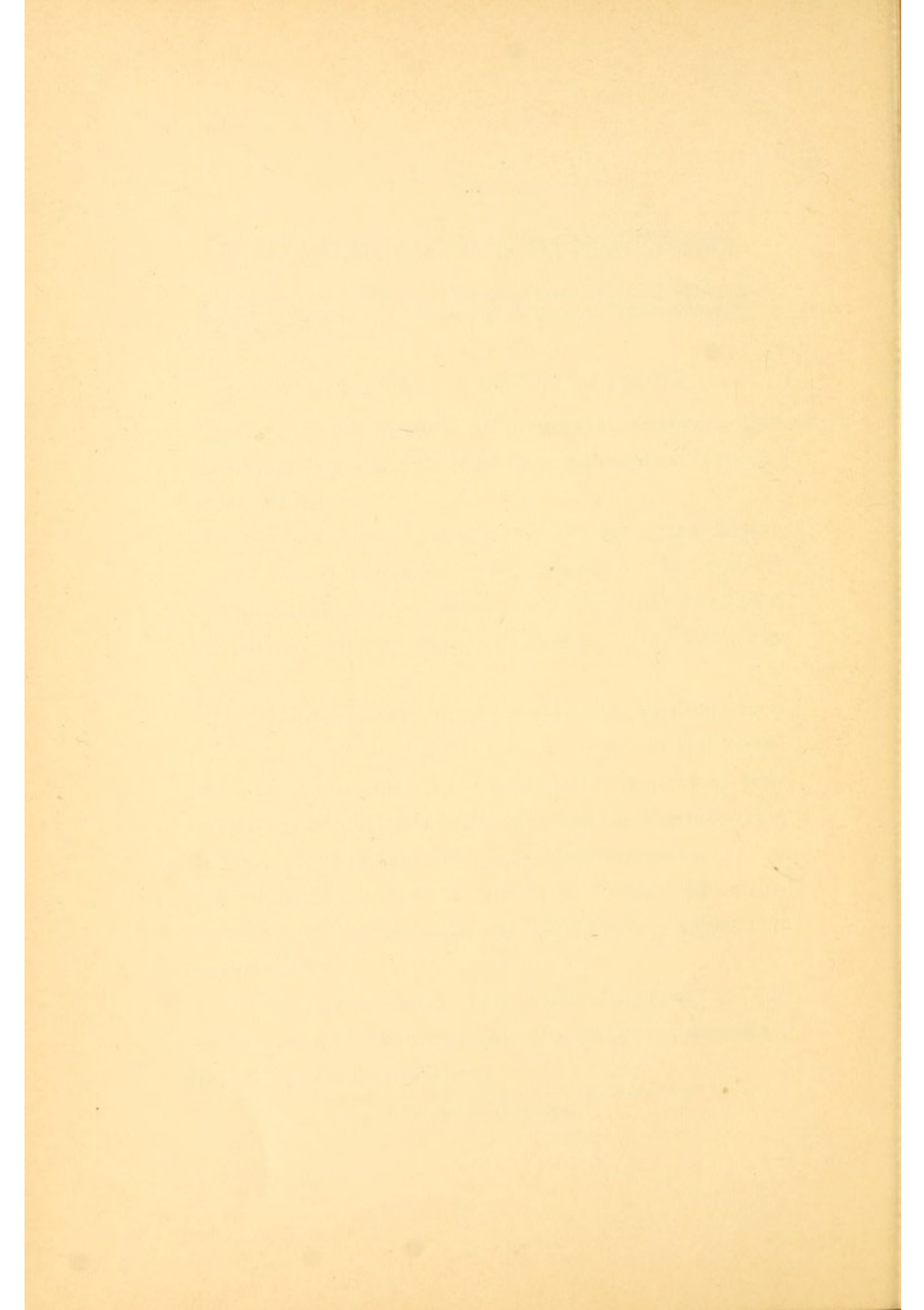
It may remain latent and finally disappear, or the bacilli may find their way into the general circulation and set up disease elsewhere.

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\* Mention these channels.







The further course and development of the disease is favored by the defective vitality of the patient. The so-called vital resistance is lessened by defective inheritance, by improper surroundings and nutrition, and by certain diseases, of which measles is the most familiar example.\* The local conditions favorable to the growth of the bacilli in the bones may be induced by injury. This has been demonstrated experimentally and confirmed by clinical observation. The congestion following slight injuries, and the delay in repair in patients suffering from latent tuberculosis and predisposed to the disease, undoubtedly determines the situation of the tuberculous focus. Growing bone is vulnerable, and particularly so in places where the circulation is most active, corresponding to the functional necessities of the part. Hence it is, that disease of the bone is more common in childhood than in adult life, and that the point of election is usually one of the epiphyses. The lower extremity is by far more often the seat of tuberculous disease than the upper.†

Tuberculous disease of bone is a chronic, insidious affection,‡ but it is characterized by occasional exacerbations of more acute symptoms, which may be induced by injury, or by depression of the vital resistance from any cause.

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\* Mention other diseases of this class.

† Why is this so?

‡ Study the minute anatomy of tuberculous disease of bone; the process of destruction; the method of repair.

Repair is usually long delayed, and it is often feeble and unstable.\* Treatment must be general as well as local.† The general condition may be improved by a proper environment, by nourishing food and by therapeutic treatment. Local repair is favored by absolute rest and by removal of the disease, if this be practicable.‡

## 2. TUBERCULOSIS OF THE SPINE. (POTT'S DISEASE.)

This affection, named after Percival Pott, who described it in the year 1779, is the most important tuberculous disease of bone. It is a chronic destructive process which begins in the bodies of the vertebræ, and is usually confined to this part of the spine.§

The bodies of the vertebræ support the weight of the body; as the disease progresses the weakened part gives way, and the upper segment inclines forward; thus an angular posterior projection (**kyphosis**) is formed, which is therefore the characteristic deformity of the disease.

**PATHOLOGY AND STATISTICS.**—The first indications of disease are most often found beneath the fibro-periosteal layer of the anterior longitudinal ligament. From this

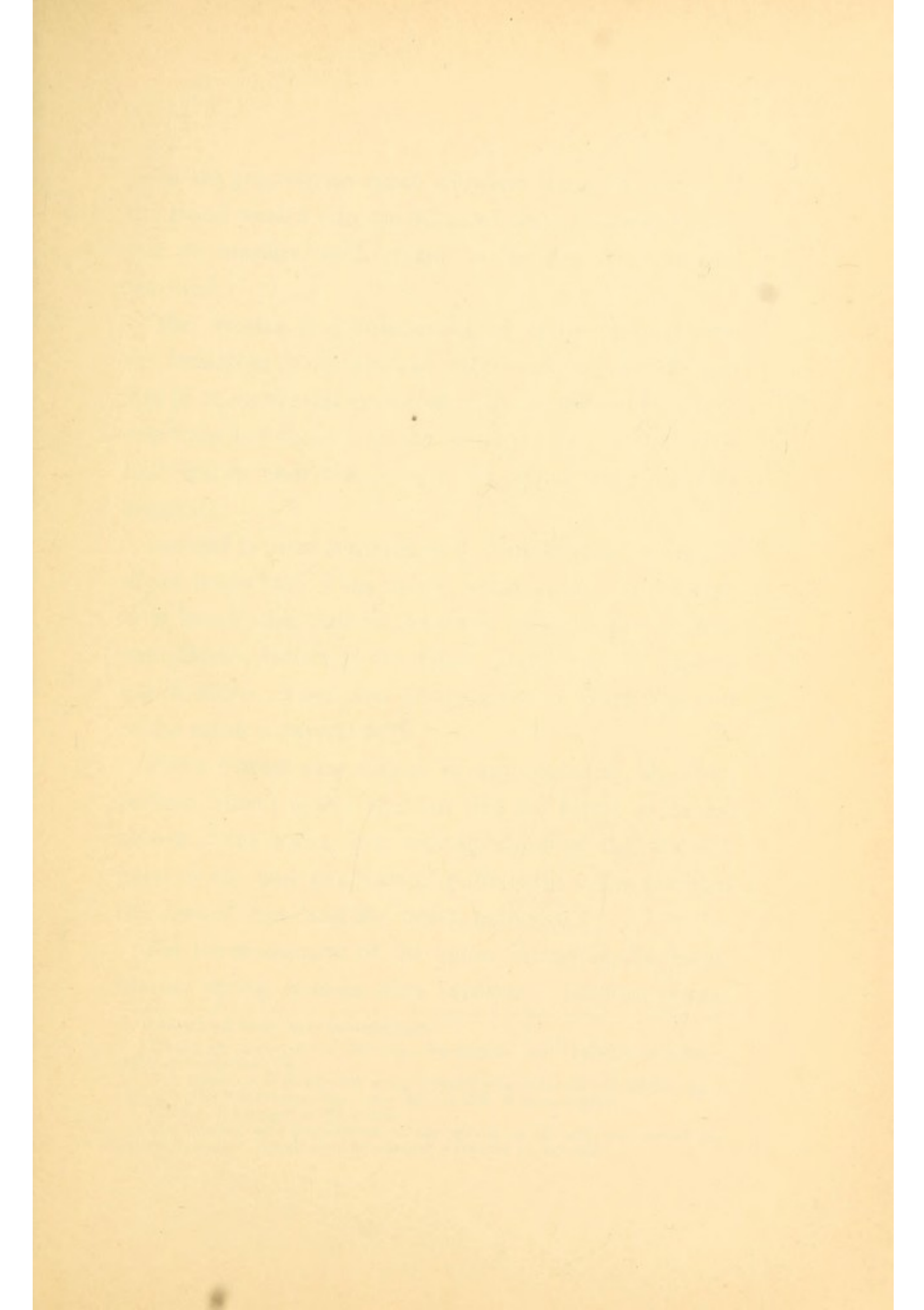
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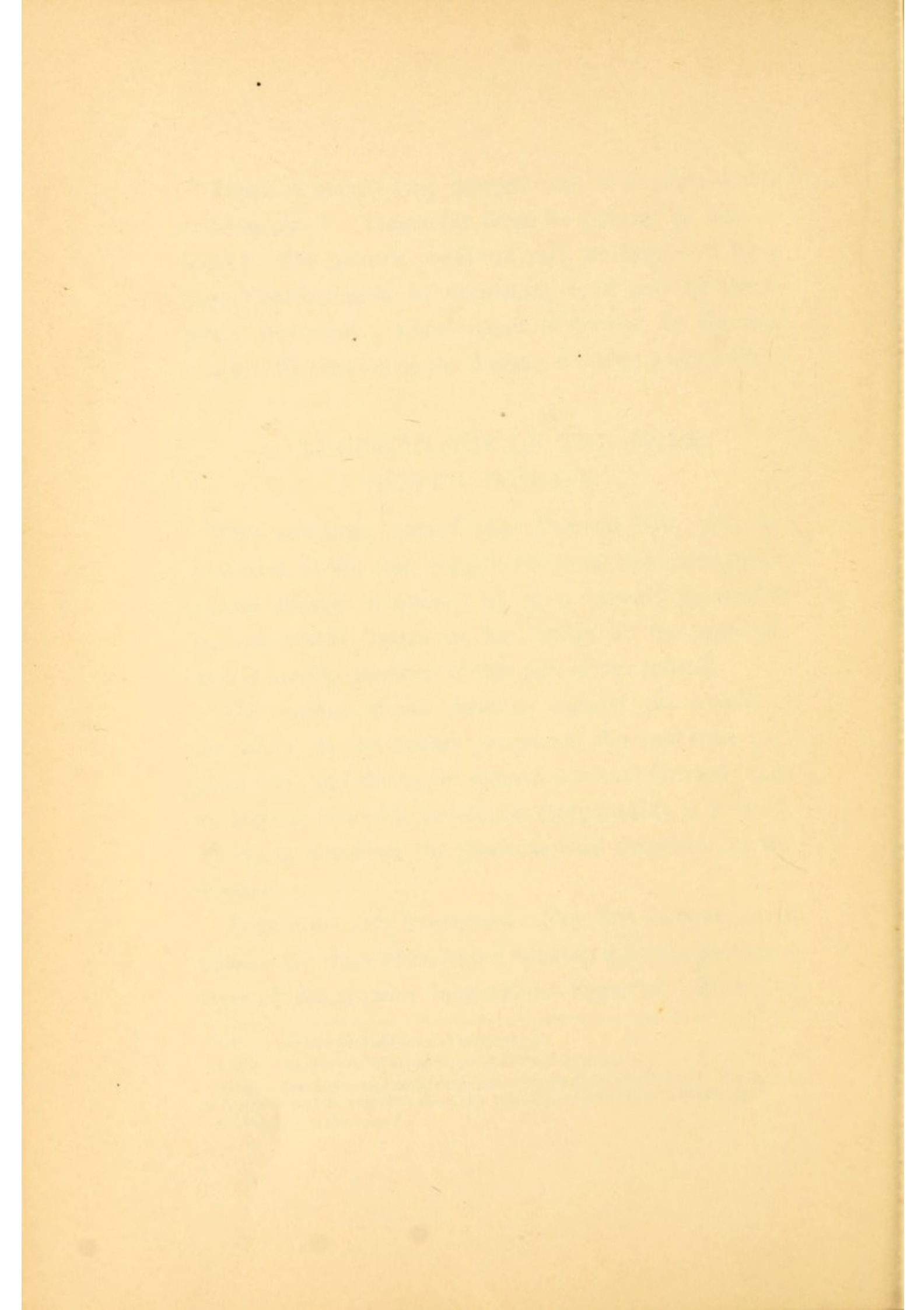
\* What are the probabilities of recurrence ?

† What are the probabilities of general dissemination ?

‡ The advantages and disadvantages of operative interference ? The age of the patient and its influence upon the selection of methods of treatment ?

§ Why is this the case ?





point the granulation tissue advances along the course of the blood vessels into the adjacent bone, extending from one to another until several bodies are more or less involved.

The disease is accompanied, in many instances, by the formation of an abscess, which may be of sufficient size to cause special symptoms ; or the tuberculous process may find its way to the posterior part of the vertebral bodies and thus involve the spinal cord, causing paralysis.

Abscess is most common as a complication of disease of the lower part of the spine, where it may be detected in at least 50 per cent. of the cases. Paralysis most often complicates disease of the upper dorsal region, appearing in about 10 per cent. of the cases in which this part of the spine is involved.\*†

Pott's disease may appear at any period of life, from earliest infancy to old age, but like all forms of tuberculosis of the bones, it is most common in the first ten years of life, and 50 per cent. of the cases begin between the ages of three and five years, inclusive.

The lower segment of the spine, including the dorso-lumbar region, is most often involved. Cervical disease

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\*How may these facts be explained?

†Study the structure of the spine, its contour and elasticity in infancy, childhood and adult life.

The influence of sitting and upright posture upon its curves; the range of motion in the different sections; the relative size of the vertebræ.

What is the length of the cord?

The number and distribution of the nerves in the cervical, dorsal and lumbar regions. Application to referred pain and to paralysis.

is relatively infrequent (Cervical,  $7\frac{1}{2}$  per cent.; Dorsal, 68 per cent.; Lumbar, 24 per cent.). The death rate is at least 25 per cent. The course of the disease is most protracted in the middle region; it is shortest in the cervical region, its duration varying in favorable cases from two to five years.

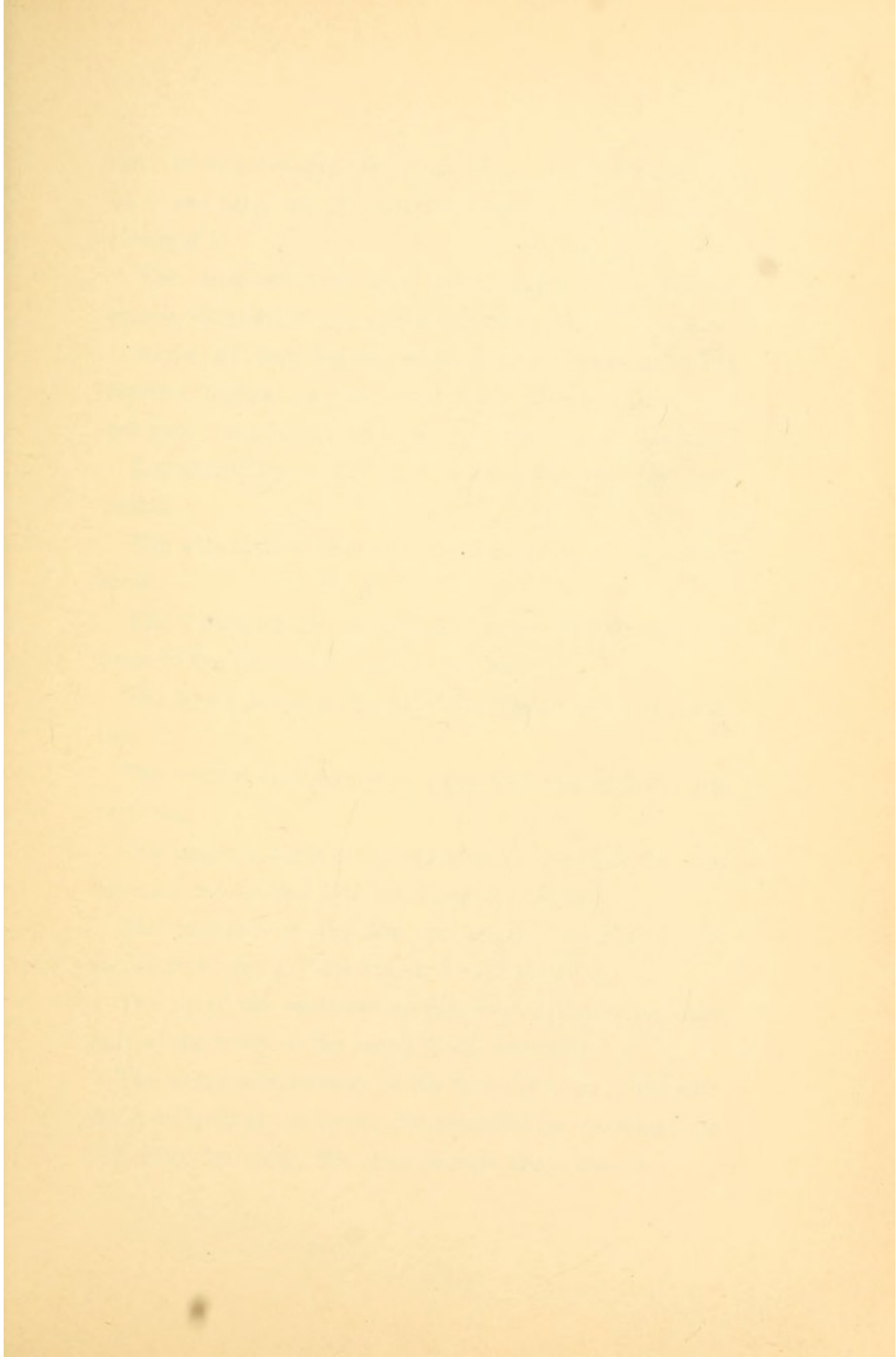
When the local resistance overcomes the tendency to degeneration, the process of repair begins. The tuberculous products are absorbed or enclosed, and ankylosis between the two segments of the spine is established by means of a union, in part fibrous, cartilaginous, and bony. Firm union is long delayed, and the deformity may increase long after the disease has become inactive.

#### ANATOMY AND LANDMARKS.

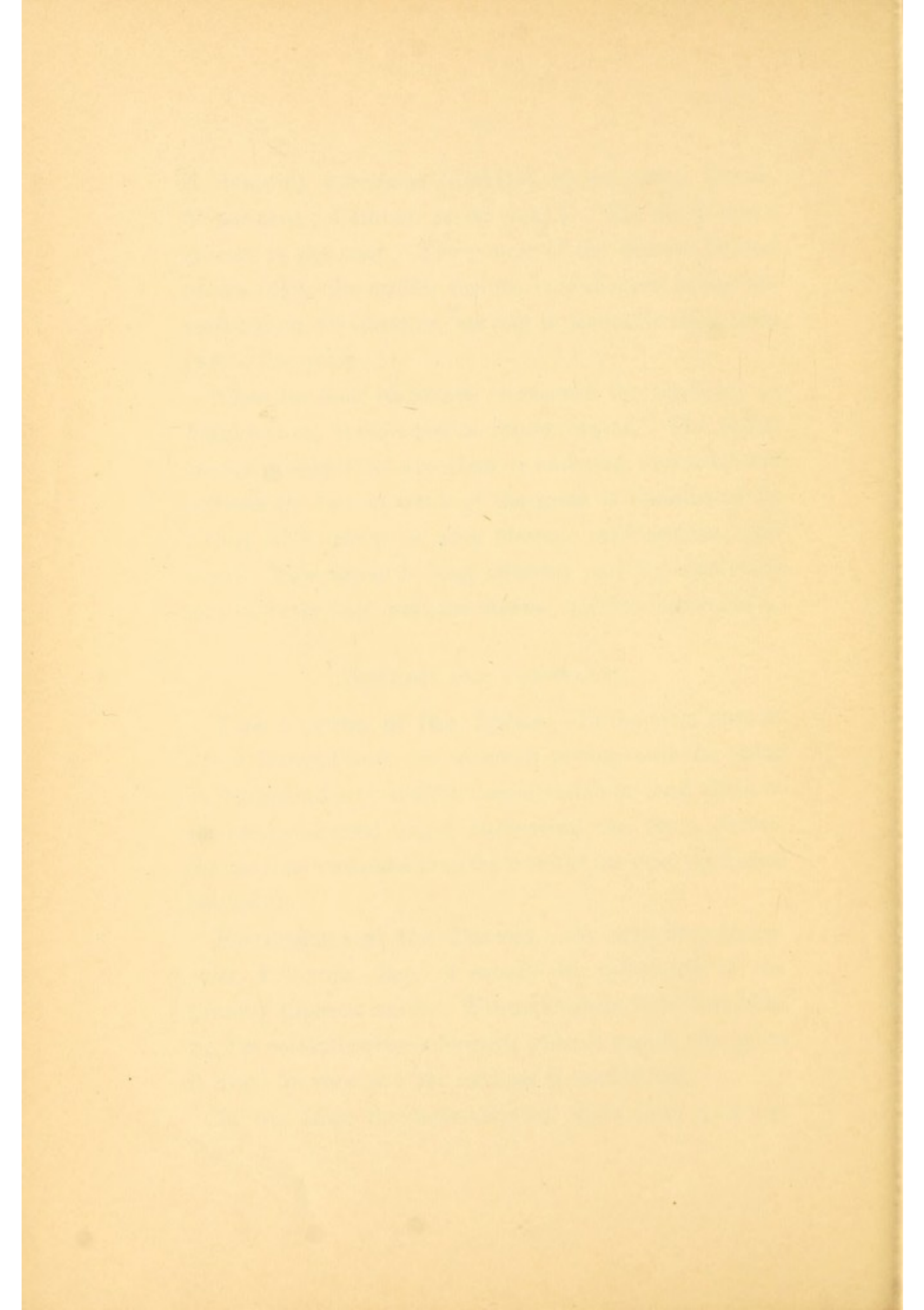
**The Curves of the Spine.**—In the erect posture a line dropped from the odontoid process cuts the spine at the second and twelfth dorsal vertebræ, and again at the sacro-vertebral angle, indicating the three curves; the cervical and lumbar to the front of the line, the dorsal behind it.

**Formation of the Curves.**—At birth they do not exist, although there is usually an indication of the primary thoracic curve. When the child holds the head up, the cervical curve is formed; when it stands, the pelvis is tilted forward and the lordosis is established.

In the adult the inter-vertebral discs form 41.9 per







cent. of the cervical, 26.4 per cent. of the dorsal, and 44.6 per cent. of the lumbar, regions of the spine.—(Dwight.)

The inter-vertebral discs are thickest in the lumbar region, thinnest in the upper dorsal (3-7).

**Area of the Spine above the Sacrum.**—The cervical region, 22.5 per cent.; the dorsal region, 47.6 per cent.; the lumbar region, 29.5 per cent.—(Dwight.)

**Landmarks.**—The atlas is on a line with the hard palate.

The axis is on a line with the free edge of the upper teeth.

The transverse process of the atlas is just below and in front of the tip of the mastoid process.

The hyoid bone is opposite the fourth cervical vertebra.

The cricoid cartilage is on a line with the sixth cervical vertebra.

The upper margin of the sternum is opposite the disc between the second and third dorsal vertebræ.

The junction of the first and second sections of the sternum is opposite the fourth dorsal vertebra.

The tip of the ensiform cartilage is opposite the lower part of the body of the tenth dorsal vertebra.

The anterior extremity of the first rib is on a line with the fourth rib at the spine, the second with the sixth, the fifth with the ninth, the seventh with the eleventh.

The scapula covers the second and the seventh ribs, its lower angle being opposite the center of the eighth dorsal vertebra.

The root of the spine of the scapula, the glenoid cavity, and the interval between the second and third dorsal spines are in the same plane.

The most constant landmark from which to count is the spinous process of the fourth lumbar vertebra, which is on a line with the highest point of the crest of the ilium. The umbilicus is near the same plane.

**The Inclination of the Pelvis.**—In the erect attitude the plane of the brim forms an angle of 60 to 65 degrees with the horizon.

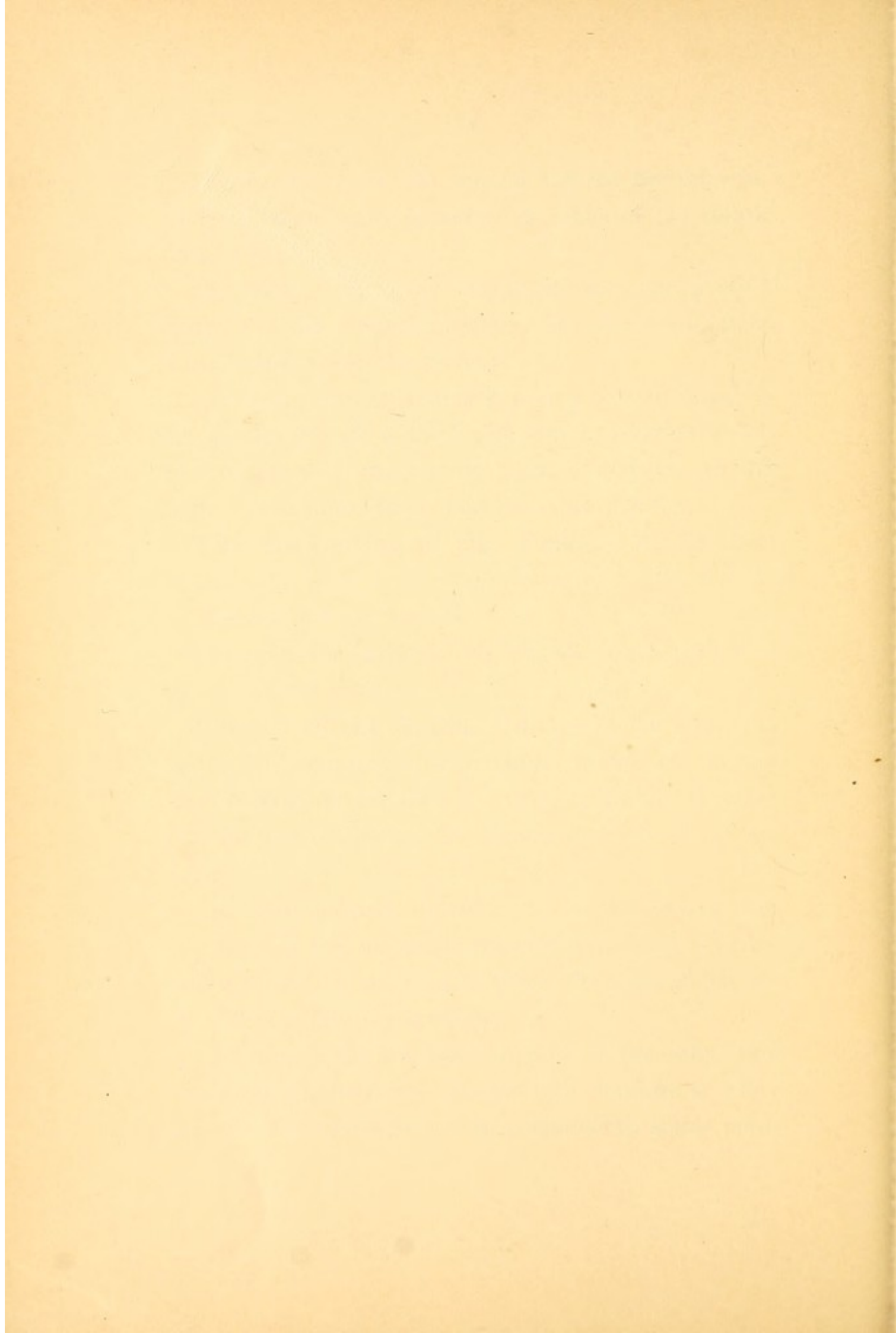
The tip of the coccyx is opposite the lower border of the symphysis pubis.

**Length of the Spinal Cord.**—In the adult the spinal cord terminates at the lower margin of the first lumbar vertebra. At birth it extends to the third lumbar and its membranes to the second division of the sacrum.

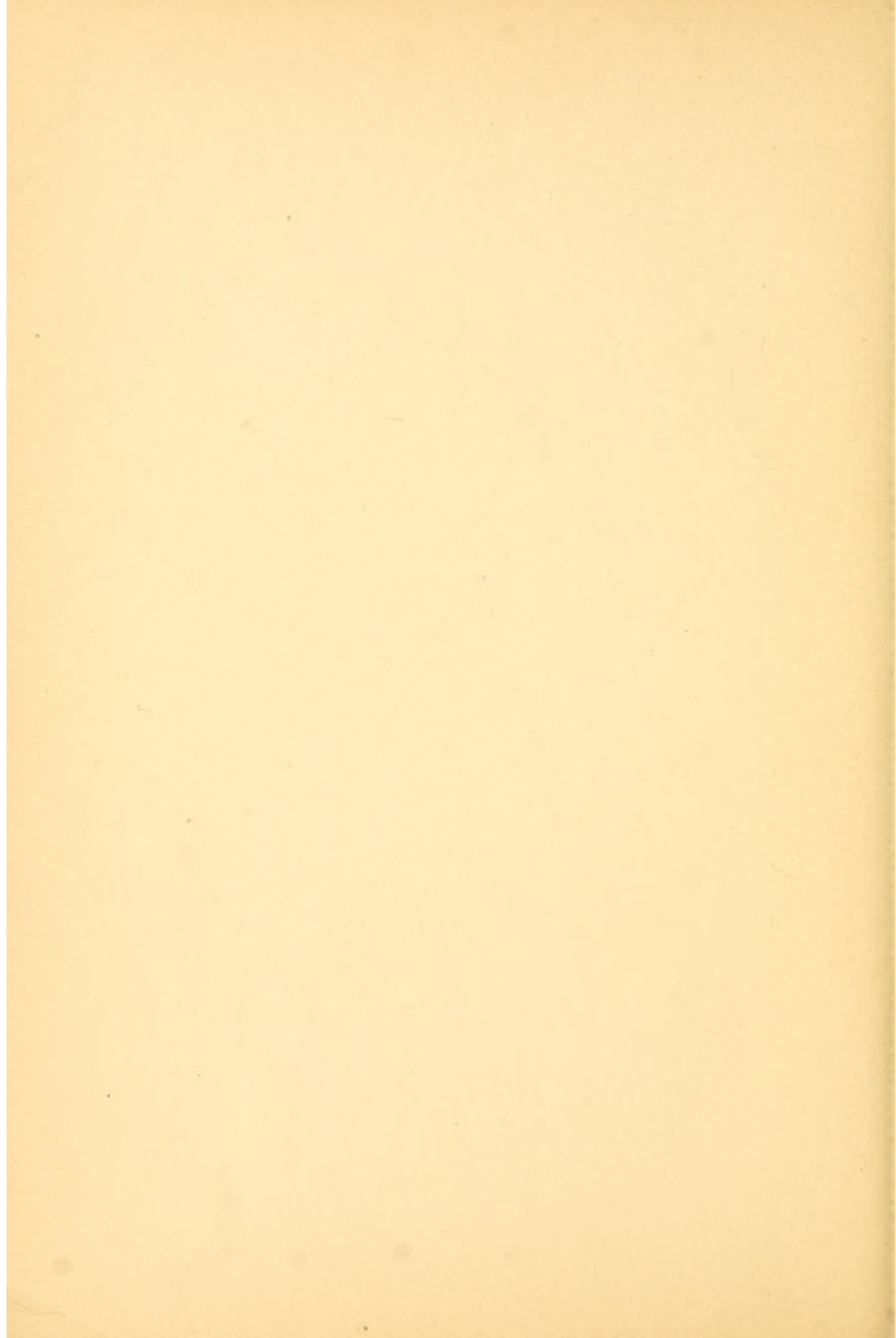
**DIAGNOSIS.**—Early diagnosis is of the utmost importance in the successful treatment of Pott's disease, and it should be easily made before the stage of deformity if the opportunity is offered.

The spine is the principal support of the body, possessing an elasticity that allows it to conform to every attitude and movement. It contains the spinal cord,









from which branch the nerves that supply the trunk and members. Although, in the course of tuberculous disease the spinal cord may be involved, or important organs in the neighborhood may be affected secondarily, yet it should be evident that the early symptoms of Pott's disease are those which interfere with its function as an elastic support. These, therefore, may be classed as primary.

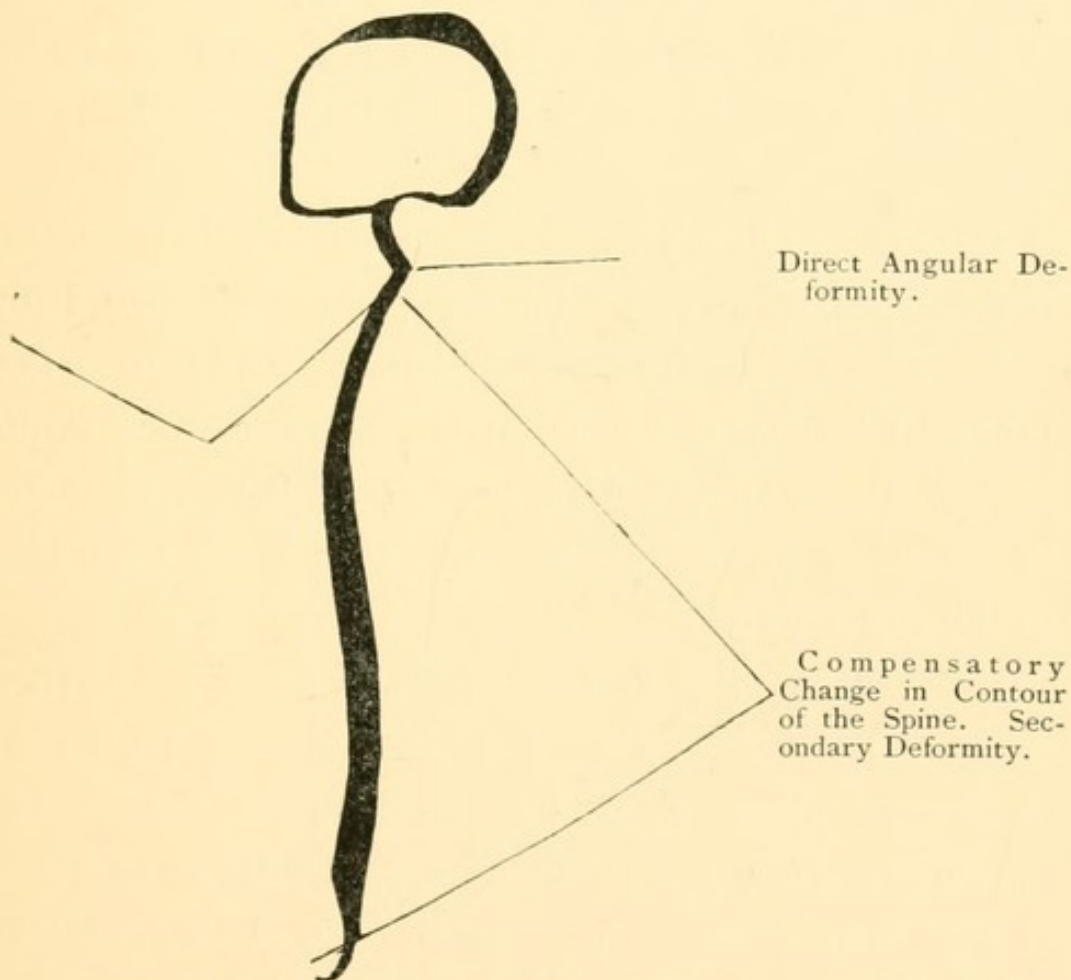


FIG. 1.— Primary and Secondary Deformity in Pott's Disease of the Cervical Region.



**The primary or diagnostic symptoms of Pott's disease :—**

1. **Pain**, usually referred to the termination of the nerves, or away from the seat of the disease. Local sensitiveness is unusual in Pott's disease.\*

2. **Stiffness**, caused by reflex muscular spasm, and in some degree also by the direct effect of the local disease.†

3. **Weakness**, caused directly by the local disease, indirectly by pain and the apprehension of pain.

4. **Awkwardness**, caused by pain, by stiffness, by weakness and by deformity. Shown by all the attitudes and movements.

5. **Deformity**. This may be divided into three classes, namely: (a) Muscular. (b) Compensatory. (c) Bony

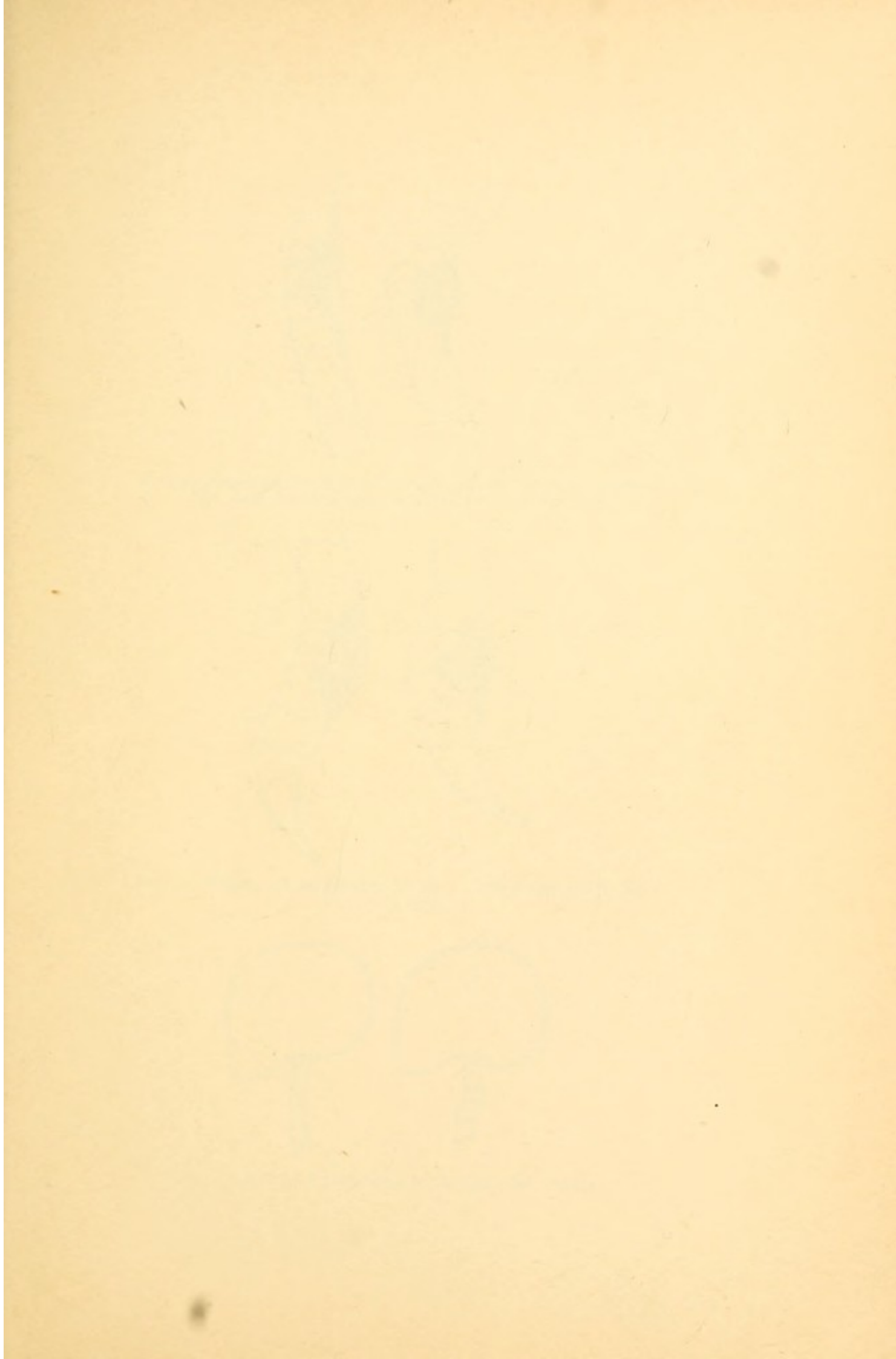
**Muscular Deformity** is due usually to reflex muscular spasm. Psoas contraction, accompanying disease of the lumbar region, and wry neck, symptomatic of disease of the cervical section, are familiar examples of this distortion.

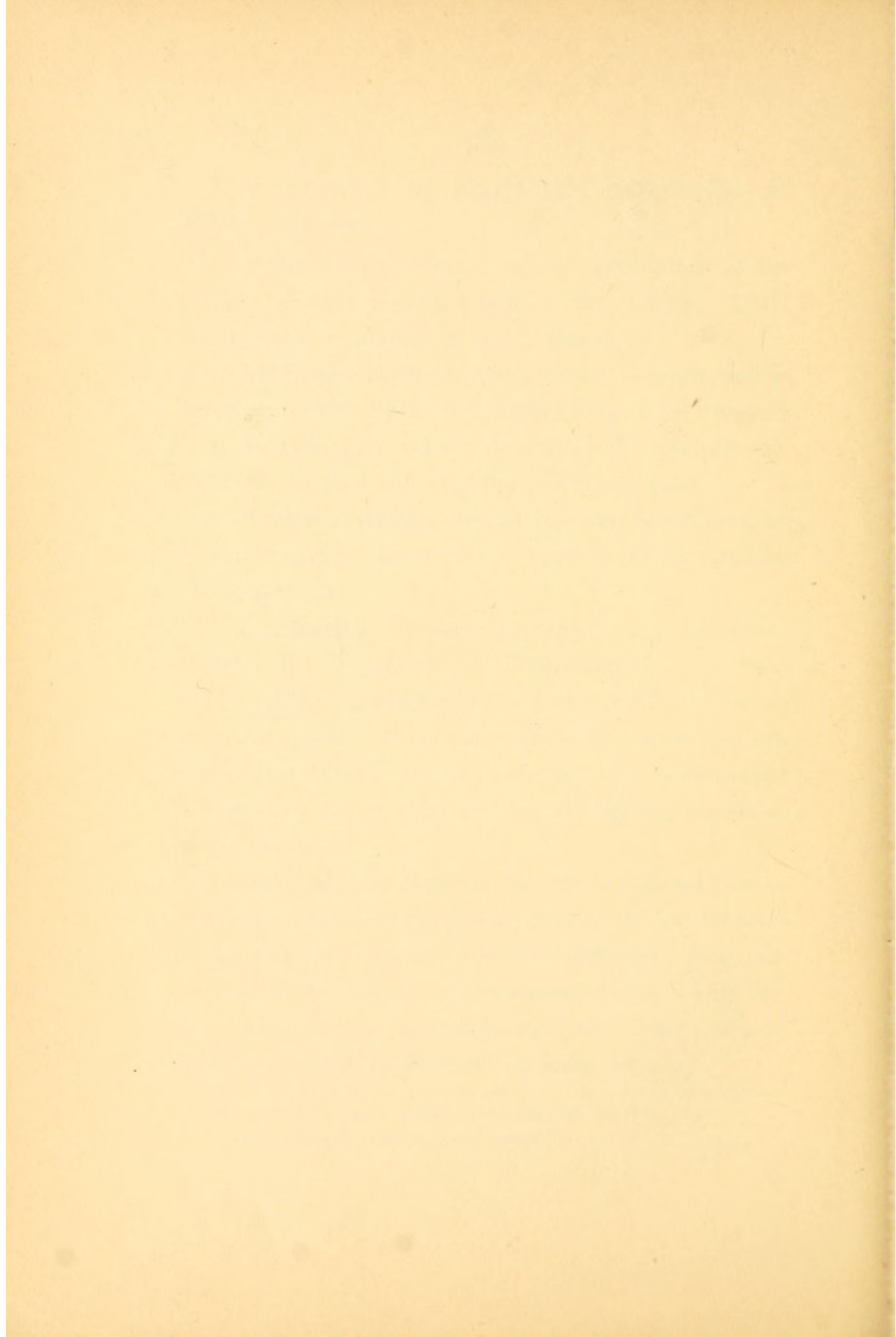
**Compensatory Deformity** is the secondary change in contour caused by the disturbance of the equilibrium of the spine, due to the primary deformity. Such, for example, is the lordosis which appears below a kyphosis to compensate or counterbalance the latter, and to enable the patient to maintain an erect posture.

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\*Why is this the case? What is the cause of the pain?

†What is meant by reflex muscular spasm?





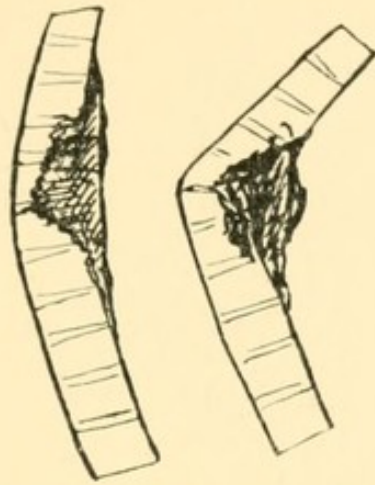


FIG. 2.—Deformity in Pott's Disease of the Thoracic Region.  
The Angular Projection is Usually Well Marked.



FIG. 3.—Disease of the Lumbar Region. The Projection is Not Often Extreme.

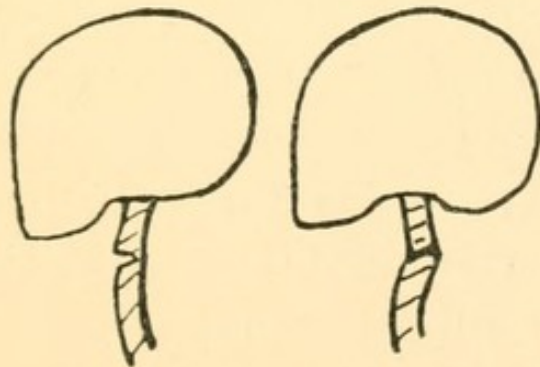


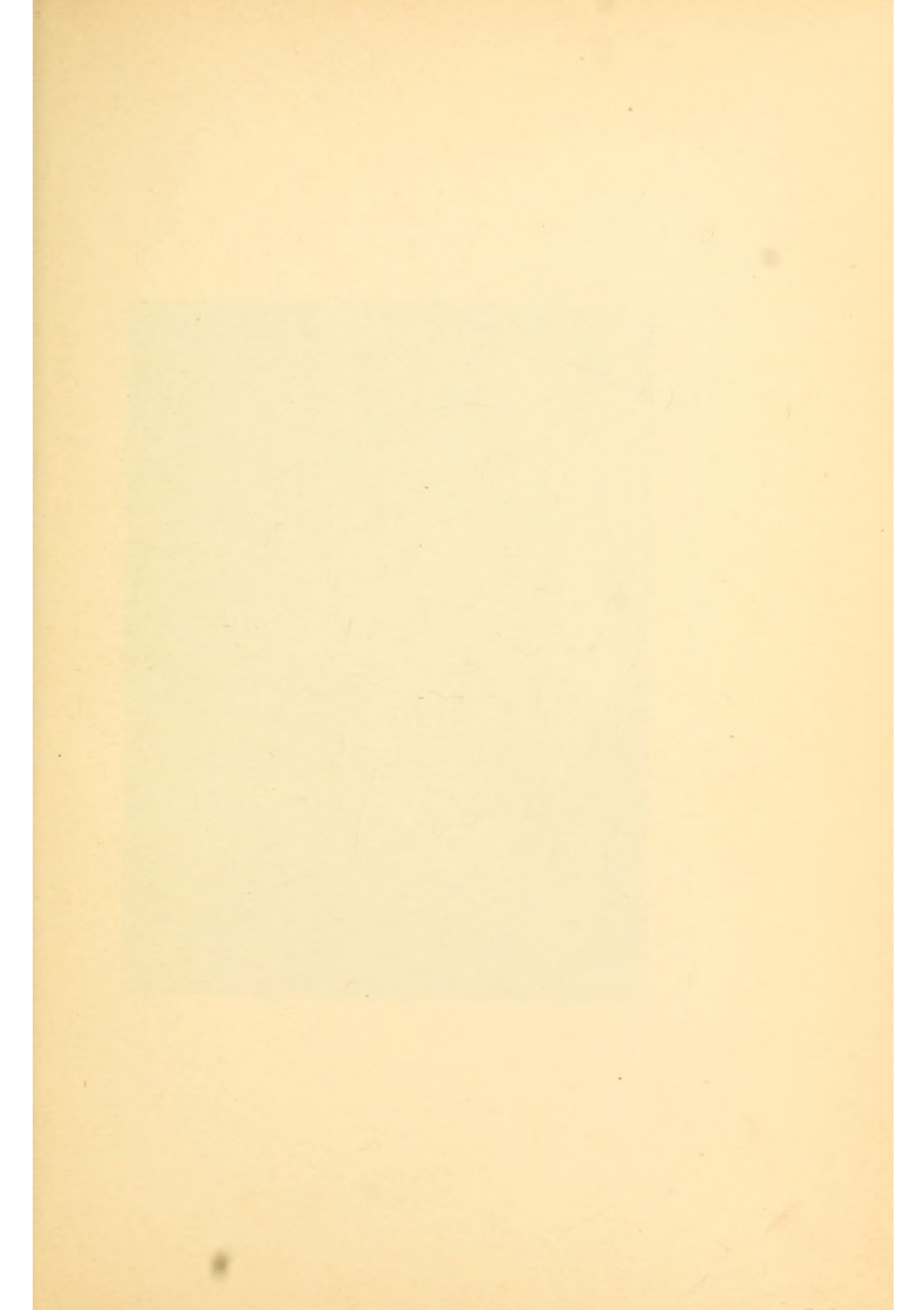
FIG. 4.—Effect of Deformity in the Cervical Region.

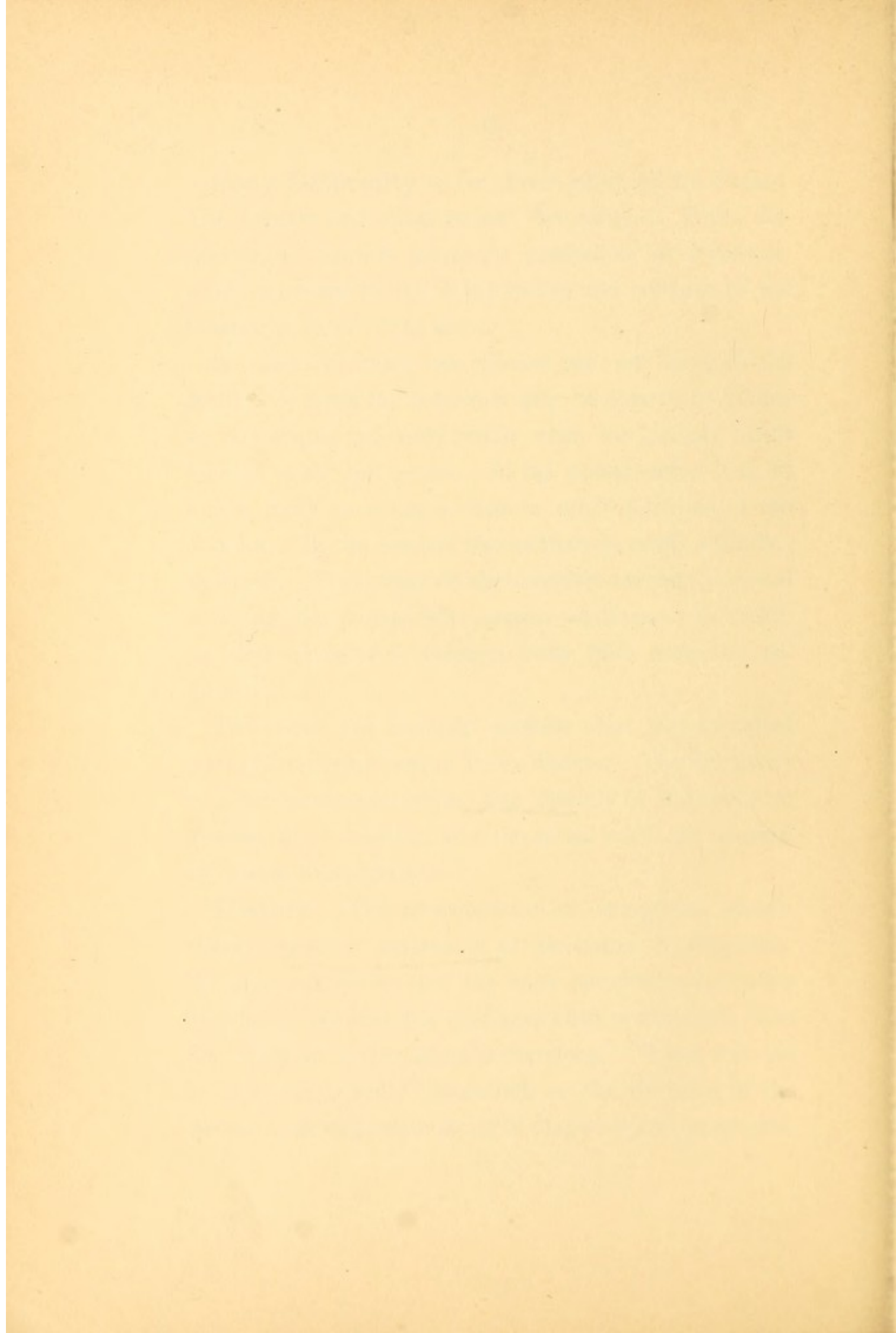
**Bony Deformity** is the direct effect of the disease. The primary and characteristic deformity of Pott's disease is an angular posterior projection or kyphosis, which is caused by the compression and collapse of the anterior portion of the spine.

In cases in which the disease has not reached the destructive stage the deformity may be absent, or it may be very slight, and only visible when the patient bends forward to the full extent. In the dorsal region it is, as a rule, more pronounced than in other portions of the column. In the cervical region there is rarely a distinct kyphosis. There may be also a certain amount of lateral curvature due to muscular spasm, weakness or to irregular destruction of a vertebral body (*vide* muscular deformity).

The above five headings include what may be called the cardinal symptoms of Pott's disease. The secondary or complicative symptoms, due directly or indirectly to abscess, or to implication of the spinal cord, are reserved for future consideration.

**History.**—The interpretation of symptoms, as obtained from the parents, is of assistance in diagnosis. We must remember that the early symptoms are often ill defined, and that they may have been overlooked. The first question to be asked is therefore, "When was the child perfectly well?" inasmuch as the duration of the disease is an important factor in diagnosis and prognosis.





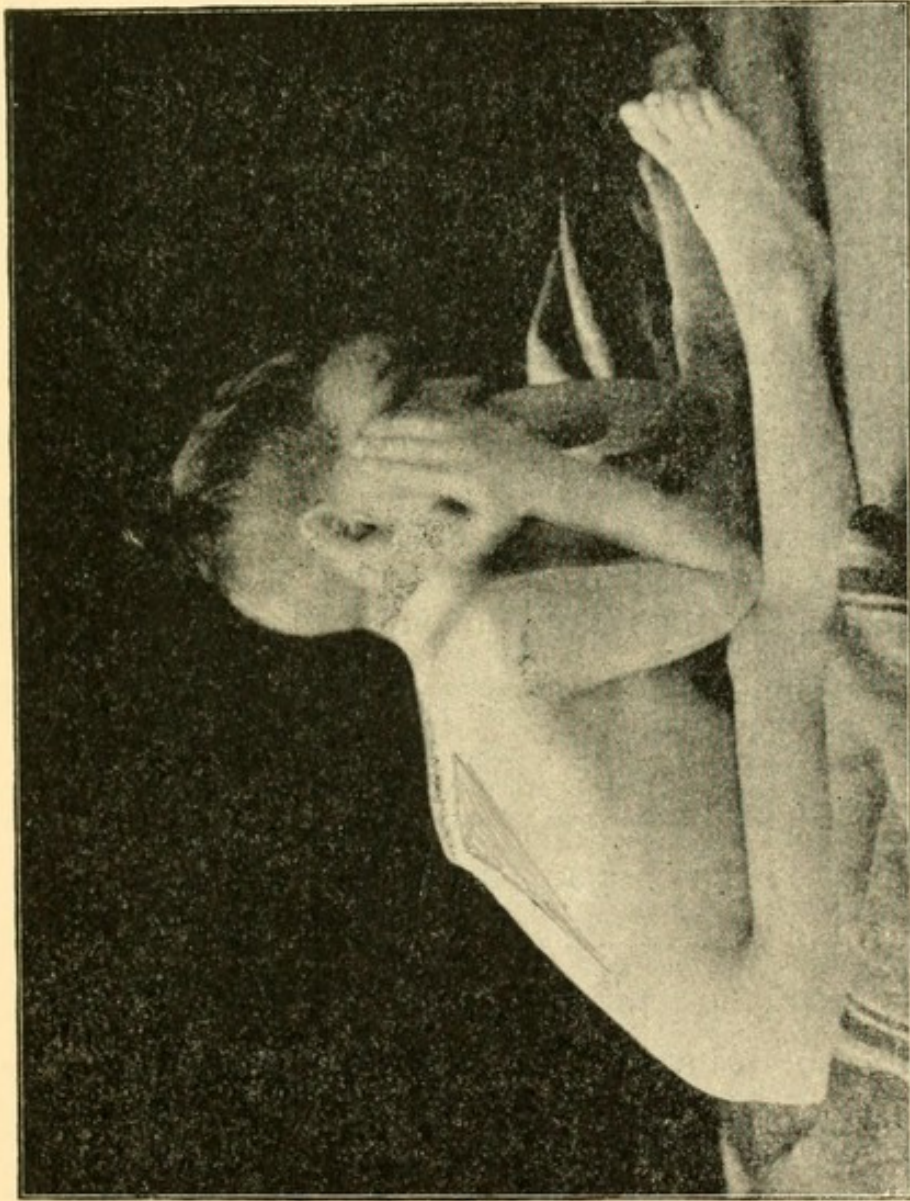


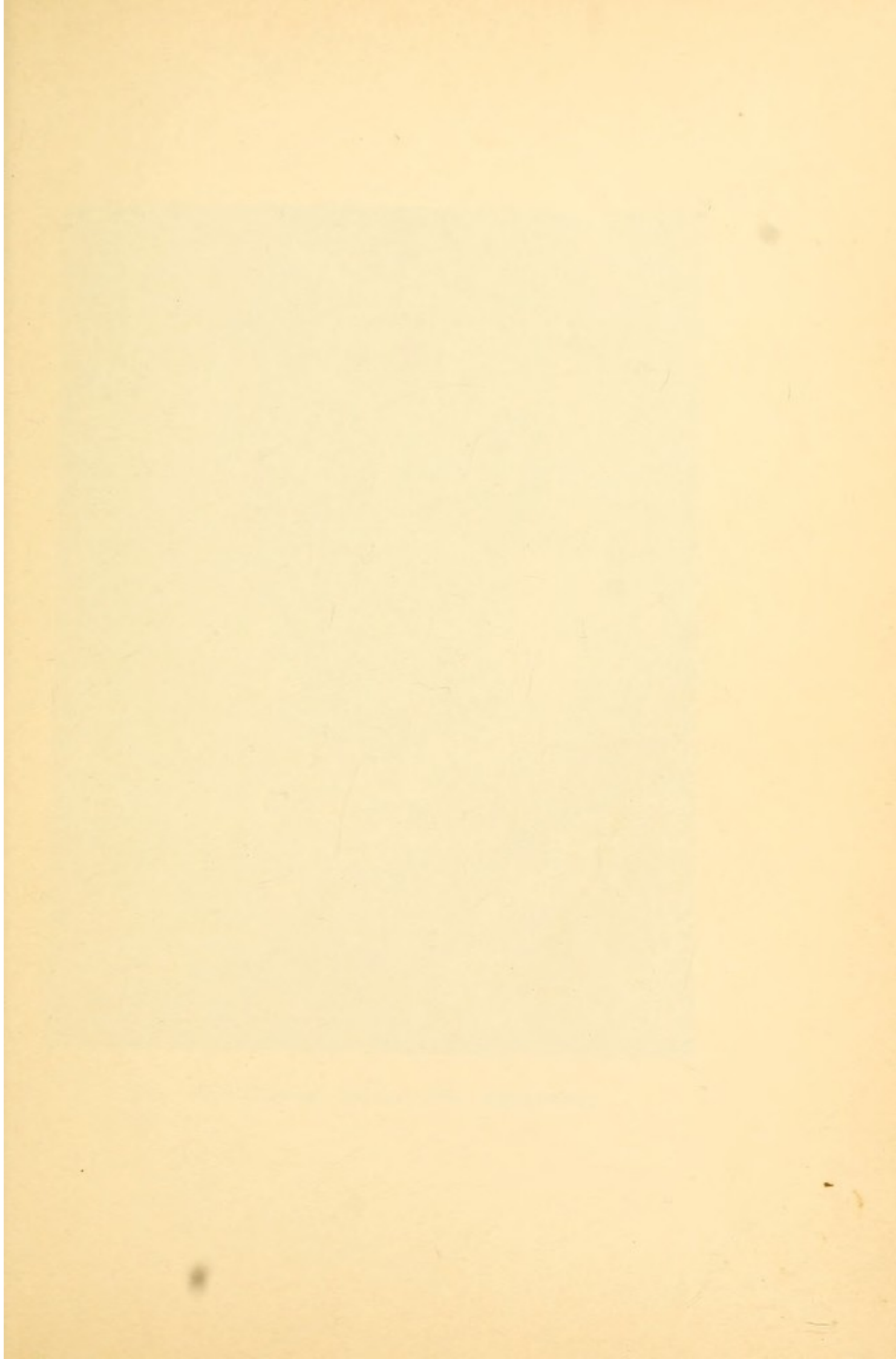
FIG. 5.—Pott's Disease. Attitude with Back Shored Up by Hands (Owen). This Illustrates the Symptom of Weakness.

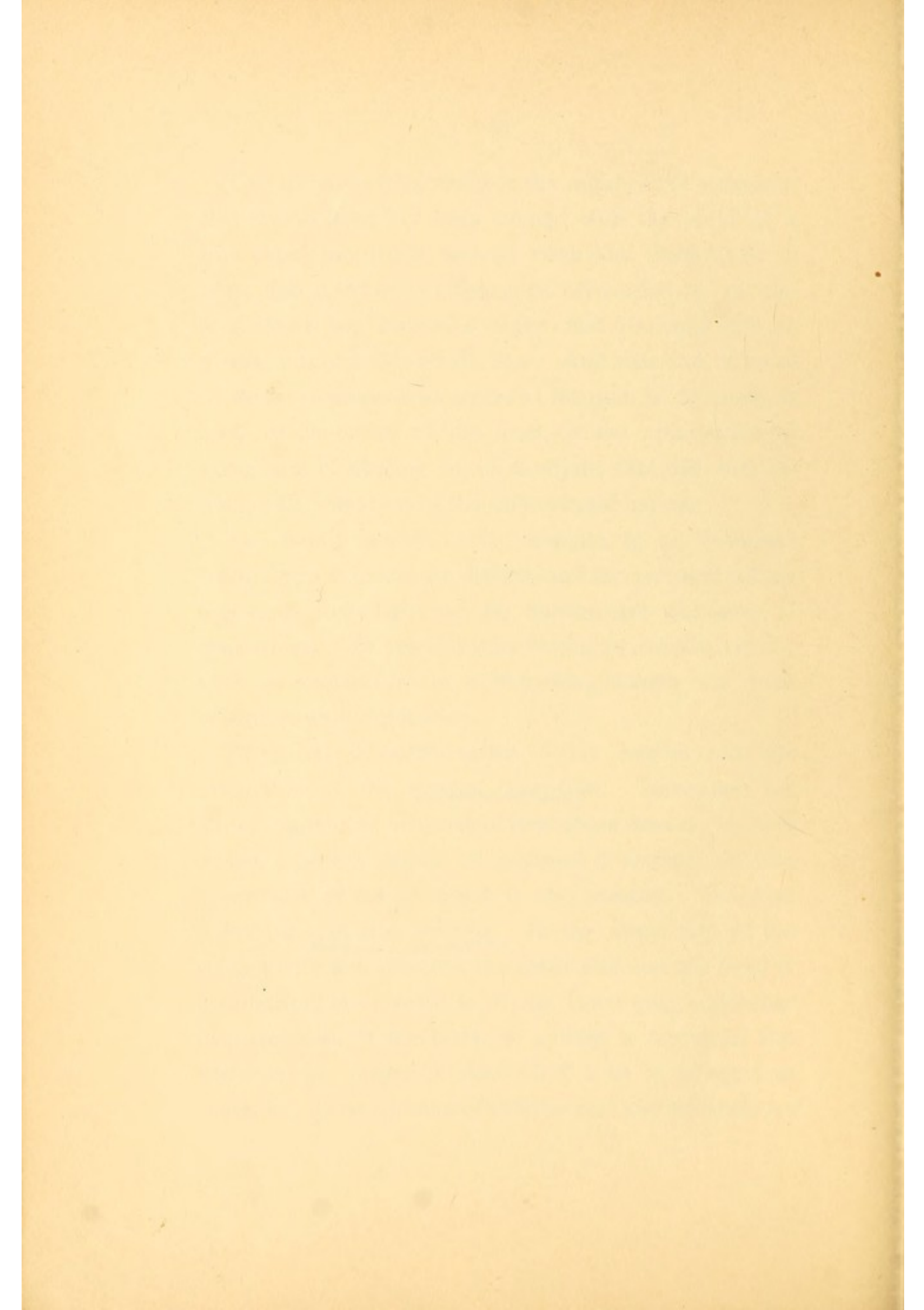


This question may recall to the mind of the attendant that "something has been wrong" with the child for a long time; that it has seemed weak and disinclined to play; that it showed evidences of discomfort on sudden jars; that it was restless at night; that it seemed stiff on getting out of bed, and the like. And that one or more of these symptoms had preceded the peculiar attitude, or limp, or distortion of the head, or the appearance of symptoms of abscess, or of paralysis, that had first attracted the attention of the unobservant parent.

The family history, with reference to an inherited tendency to tuberculous disease, and the personal history may throw some light on the quality and resistance of the patient. The possible contributing or exciting causes, such as traumatism or predisposing disease, are often of interest and importance.

**Physical Examination.**—This begins with the inspection of the general condition. Sometimes the patient shows the evidence of depressing disease, in other words, a certain degree of cachexia is present; but the appearance of robust health is not unusual. One next notes the gait and attitude. If the upper part of the spine is affected, the neck is usually stiff and the head is distorted; if the disease is of the lower part, a peculiar over-erectness of the body, or a limp is common; but wherever the disease is situated, if it be at all acute in character, the symptoms of stiffness and awkwardness are





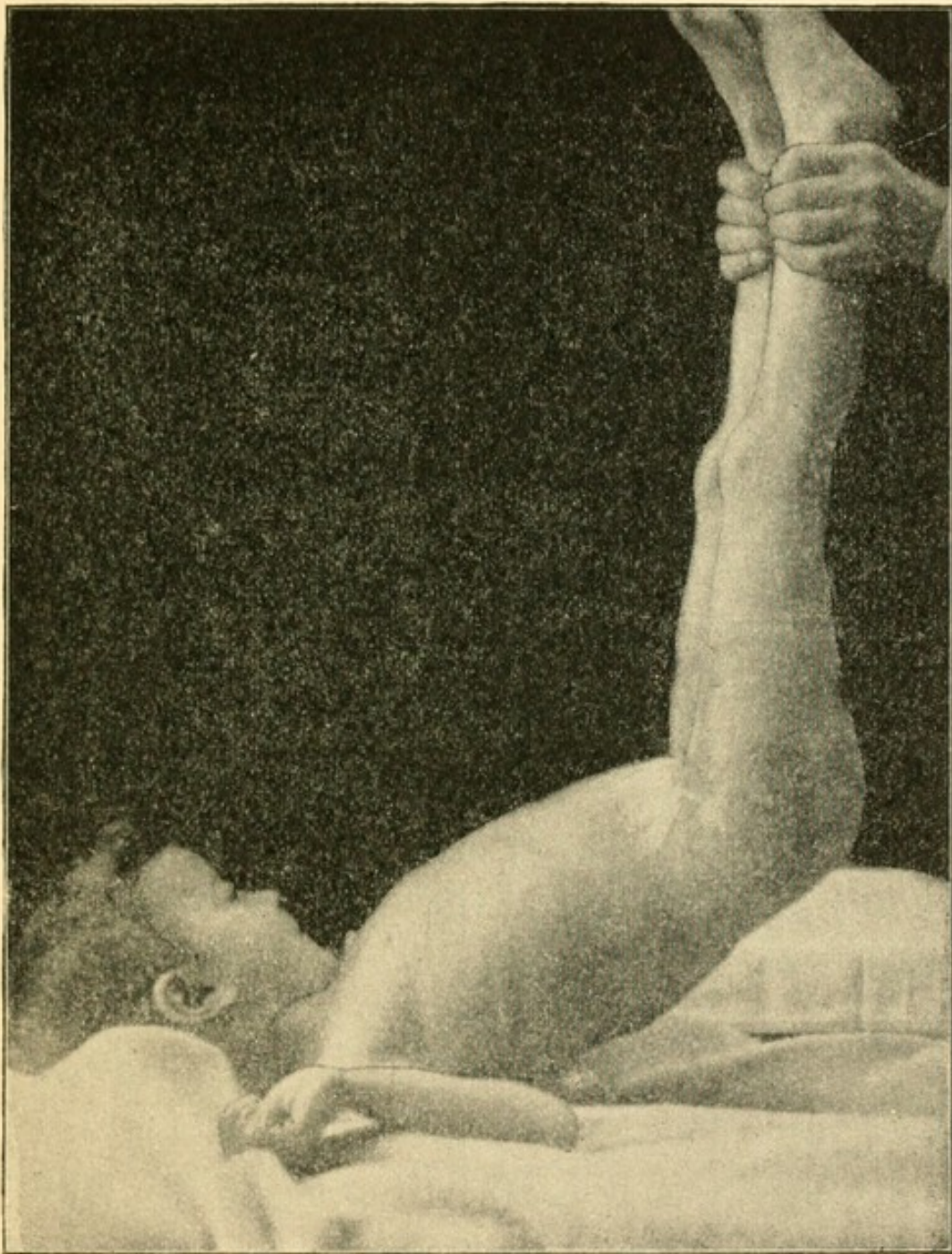


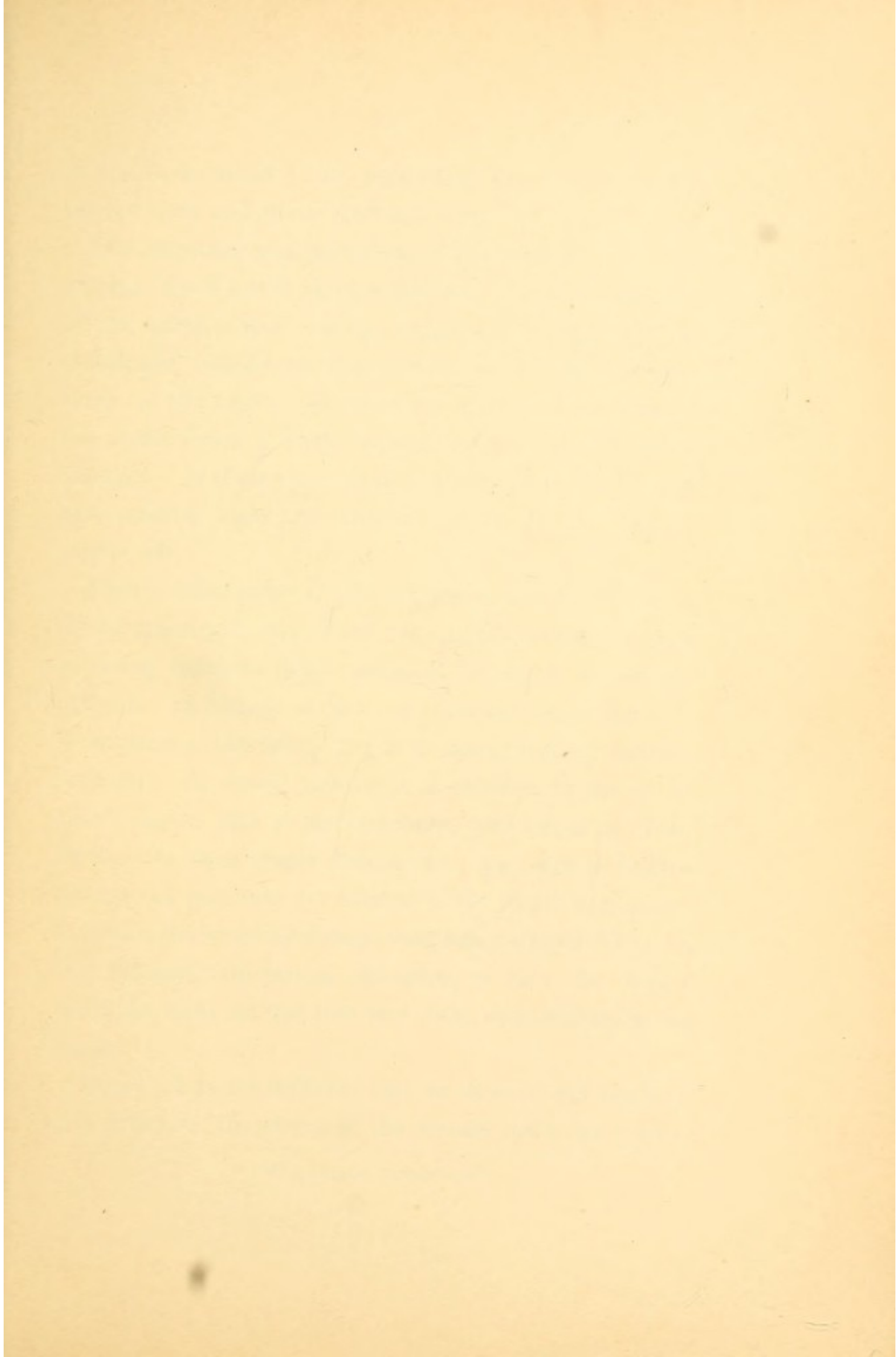
FIG. 6.—Pott's Disease. Spine Absolutely Rigid (Owen).

very evident. The gait is careful; the steps are short; the patient often toes in, and sways the body from side to side,—“waddles.”

The elements of the gait and attitude that “favor” the sensitive spine are the backward tilt of the body which tends to remove the pressure from the vertebral bodies, and the tip-toeing step which relieves it from jar.

The limitation of motion due to muscular spasm, to pain, and to the local disease is an important factor in diagnosis. This, together with the deformity, may be demonstrated by bending the patient's body directly forward to the fullest extent. An object is next placed on the floor, and the patient is directed to pick it up. If this is done awkwardly by squatting or kneeling, it demonstrates weakness and stiffness. The patient should next be placed prone upon a table, and the surgeon should test the flexibility of the spine by lifting the legs and swaying the body from side to side. The range of extension at the hips may be tested at this time by holding the pelvis against the table with one hand, while the thigh is over-extended with the other. This is the test for the slight degree of psoas contraction that is often present on one or both sides in disease of the lower region.

The flexibility of the upper part of the spine may be tested by voluntary and passive movements of the head in various directions, and the range of motion of the





occipito-atlo-axoid joints by holding the neck while the patient nods and turns the head from side to side.

The character and the extent of the deformity, if it be present, should next be investigated. Note the contour of the spine. Any changes from the normal are, in childhood, suspicious circumstances.\* Note the elasticity of the spine. If when the child is bent forward the spine forms a long, regular, even curve, disease is unlikely. If there be a break in the outline, and if one part remains rigid and another bends, disease may be suspected.

**Pain.**—The point to which pain or discomfort is referred may help to determine the seat of disease, although in young children the localization of pain is sometimes difficult. In disease of the upper cervical region the pain is referred to the head, and it is aggravated by sudden motions. In dorsal disease it is referred to the intercostal region and to the abdomen, and lateral pressure on the ribs often causes discomfort. In cases of lumbar disease the pain may be referred to the thighs and knees. Pain is aggravated by sitting, bending, rotating the body, and especially on jarring the spine, as when the patient raises the body on the toes and sinks suddenly upon the heels.

Inasmuch as the different regions vary in both function and structure, the effects of the disease upon the mecha-

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\*Why more so in childhood?



nism of the body differ considerably, according to the situation of the lesion. It will be of advantage, therefore, to divide the spine into sections and to describe the characteristics of the disease in each section separately. These sections correspond very closely to the normal curves of the spinal column, although function rather than form is the important consideration.

**1. The Lower Region.**—This includes all the lumbar and the two lower dorsal vertebræ; it is the region of free motion concerned in stooping, in turning, and in balancing the body as the patient walks. Consequently stiffness is an early and important symptom of disease in this region.

**2. The Middle Region.**—This includes the dorsal vertebræ, from the third to the tenth, inclusive. Here the spine forms a part of the bony framework of the thorax, and as the motion is slight,\* early symptoms of disease are not, as a rule, well marked.

**3. The Upper Region.**—This comprises the remainder of the spine. In this region the movements of the head are carried out, and it includes the special joint mechanism for the nodding and rotatory motions.†

In the first and third regions the curvature of the spine is forward, a normal lordosis; in the middle region it is backward, a normal kyphosis.‡ In the upper and

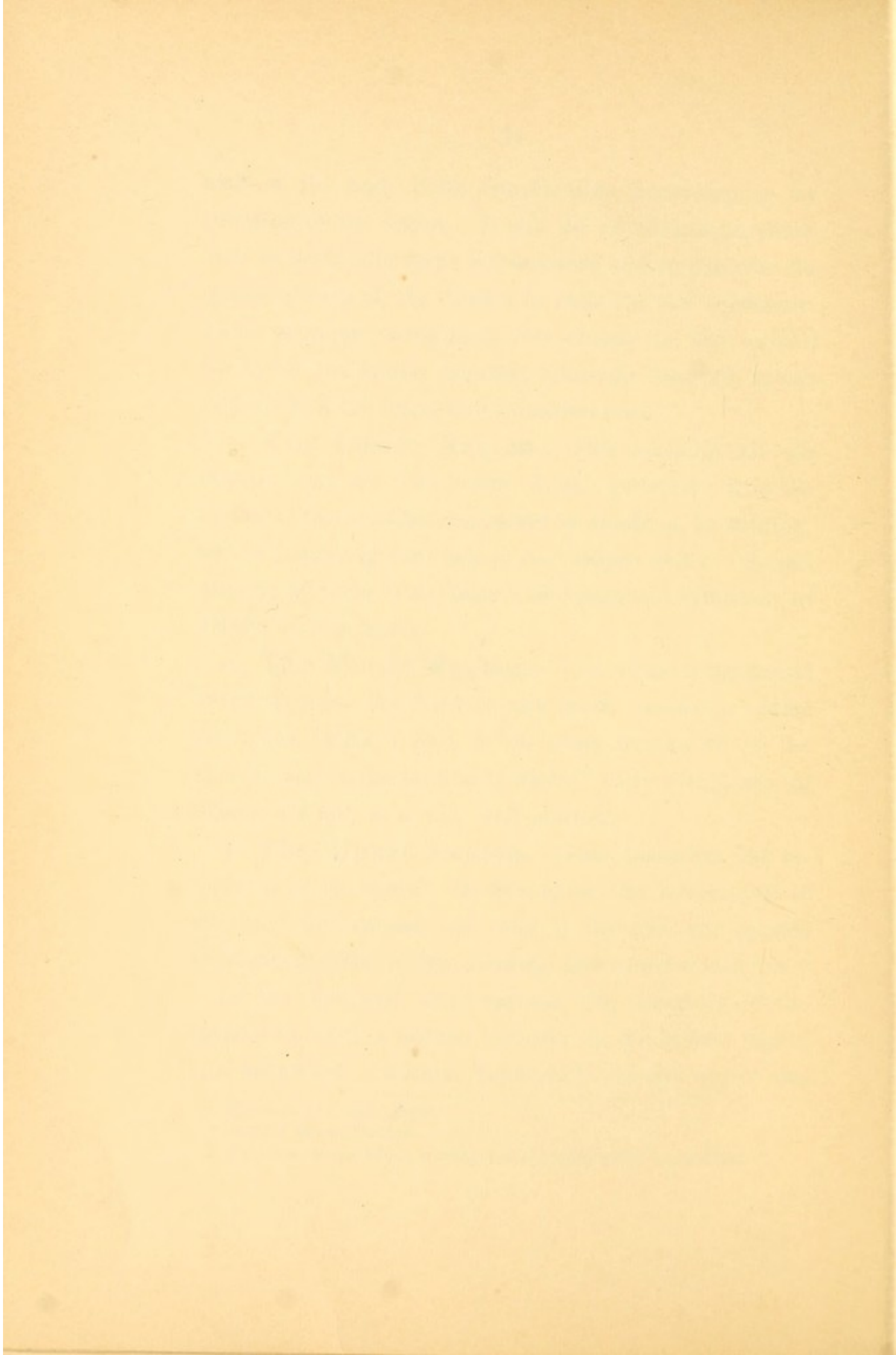
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\* Why is motion slight there?

† Describe this mechanism.

‡ What are the variations in contour of the spine within normal limits?





lower regions the disturbance of function and the muscular rigidity or contraction often call attention to the disease before the stage of bone destruction; in the middle region deformity often appears before the other symptoms attract attention.

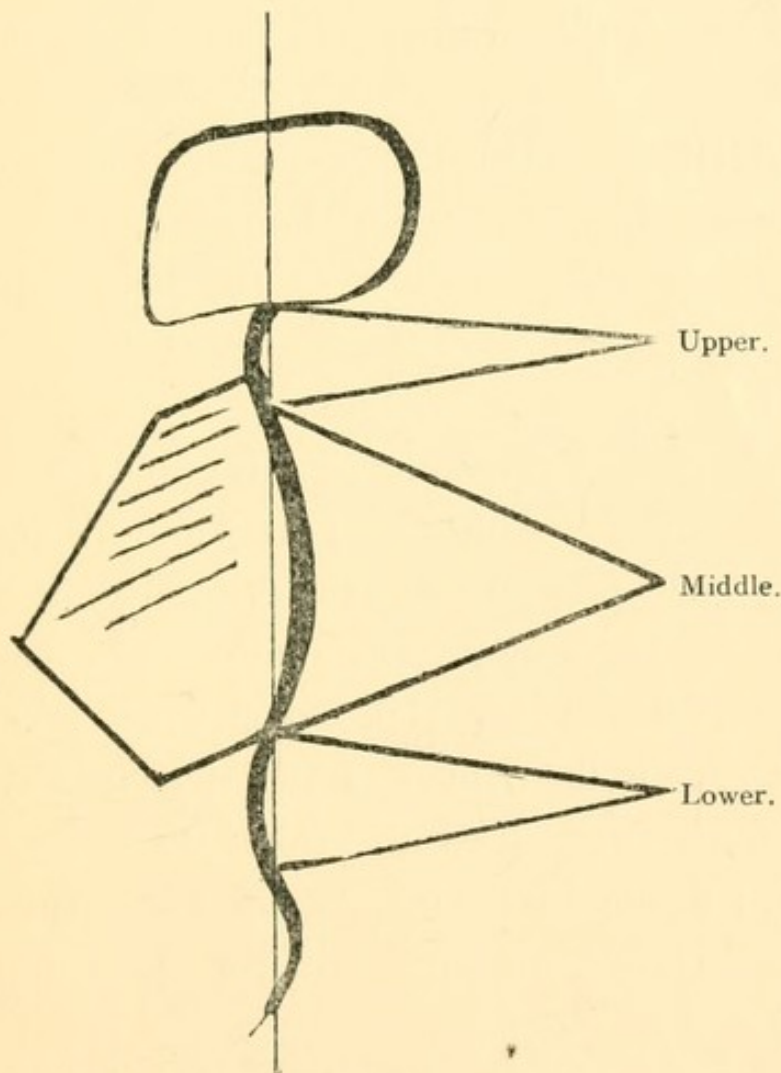


FIG. 7.—The Divisions of the Spine to be Considered in the Diagnosis and Treatment of Pott's Disease.

**I. Pott's Disease in the Lower Region** of the spine presents the following characteristics :—

**1. Pain.**—The pain is referred to the lower part of the abdomen, to the genitals, to the loins, or to the thighs.

**2. Gait.**—The waddling gait which has been described under general symptomatology is characteristic of disease in this region. In some cases there is a limp.\*

**3. Attitude.**—Usually an abnormal erectness and sometimes an exaggerated lordosis; in some instances a lateral inclination of the body. Unilateral psoas contraction and the attendant limp are often present.

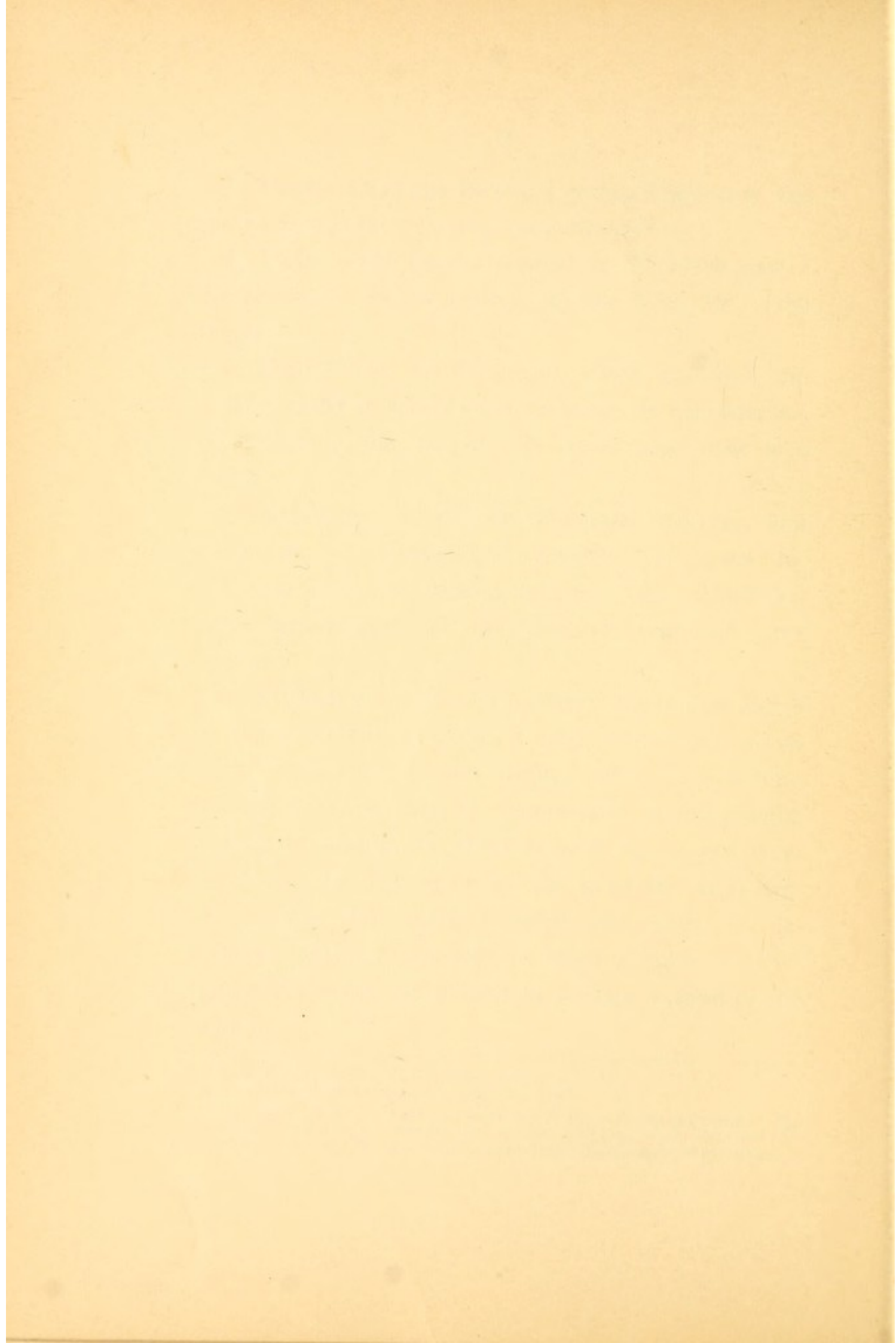
**4. Stiffness.**—Muscular rigidity of the lumbar region interferes directly with almost every attitude and movement. The effect of this stiffness and of the accompanying weakness may be demonstrated by the popular method of asking the child to pick up a coin from the floor. In this region of the spine the symptoms are usually well marked before the stage of deformity; flexion of the leg, the effect of psoas contraction, and abscess, are present in perhaps a third of the cases.†

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\* Describe the test for slight psoas contraction.  
How may deep abscess in the loin be detected?

† Explain in detail the causes of each one of the indications of disease that have been enumerated. Describe the test for stiffness. How does one distinguish the rigidity due to muscular spasm from rigidity from other causes?





**II. Pott's Disease of the Middle Region** is characterized by the following peculiarities :—

**1. Pain** is referred to the lateral region of the thorax or to the front of the body. It is a common symptom. It is noted after sudden movements or after compressing the chest, as when the child is suddenly lifted from the floor.

**2. Respiration.**—If the disease is at all active, a grunting respiration is usually present, especially after\* exertion. This is the most characteristic of all the symptoms, especially so in young subjects.

**3 Attitude.**—This is not always distinctive, but usually there is a peculiar shrugging squareness of the shoulders ; occasionally a lateral inclination of the body. The head is often inclined backward.† The neck seems short on account of elevation of shoulders.

**4. Deformity.**—The deformity is usually prominent and it appears early in the disease.

**5. Complications.**—The most common complication of dorsal disease is paralysis, abscess being less frequent than in the lumbar region.‡ Flat chest and chicken breast may be secondary deformities.§

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\* Give reasons for this.

† Give reasons for this.

‡ Give reasons for this.

§ Explain the mechanism of such deformity.



**III. Pott's Disease of the Upper Region** presents the following peculiarities :—

1. If the uppermost cervical vertebræ are diseased, the **pain** is referred to the head, particularly to its lateral and posterior aspects. In disease of the middle cervical region, it is referred to the neck, or to the shoulders or chest.

2. The **weakness and stiffness** are manifested by the **attitude**. The head cannot be turned freely. If the disease be in the occipito-axoid region, the nodding and rotary motions are restricted. The chin is often depressed and slightly turned to one side. Lateral distortion resembling torticollis\* usually occurs when disease is nearer the middle of the cervical region.†

3. The bony **deformity** is often slight or absent, but thickening of the tissues about the spine and local sensitiveness to lateral pressure are usually present. Retro-pharyngeal **abscess** is not uncommon when the atlo-axoid region is involved.

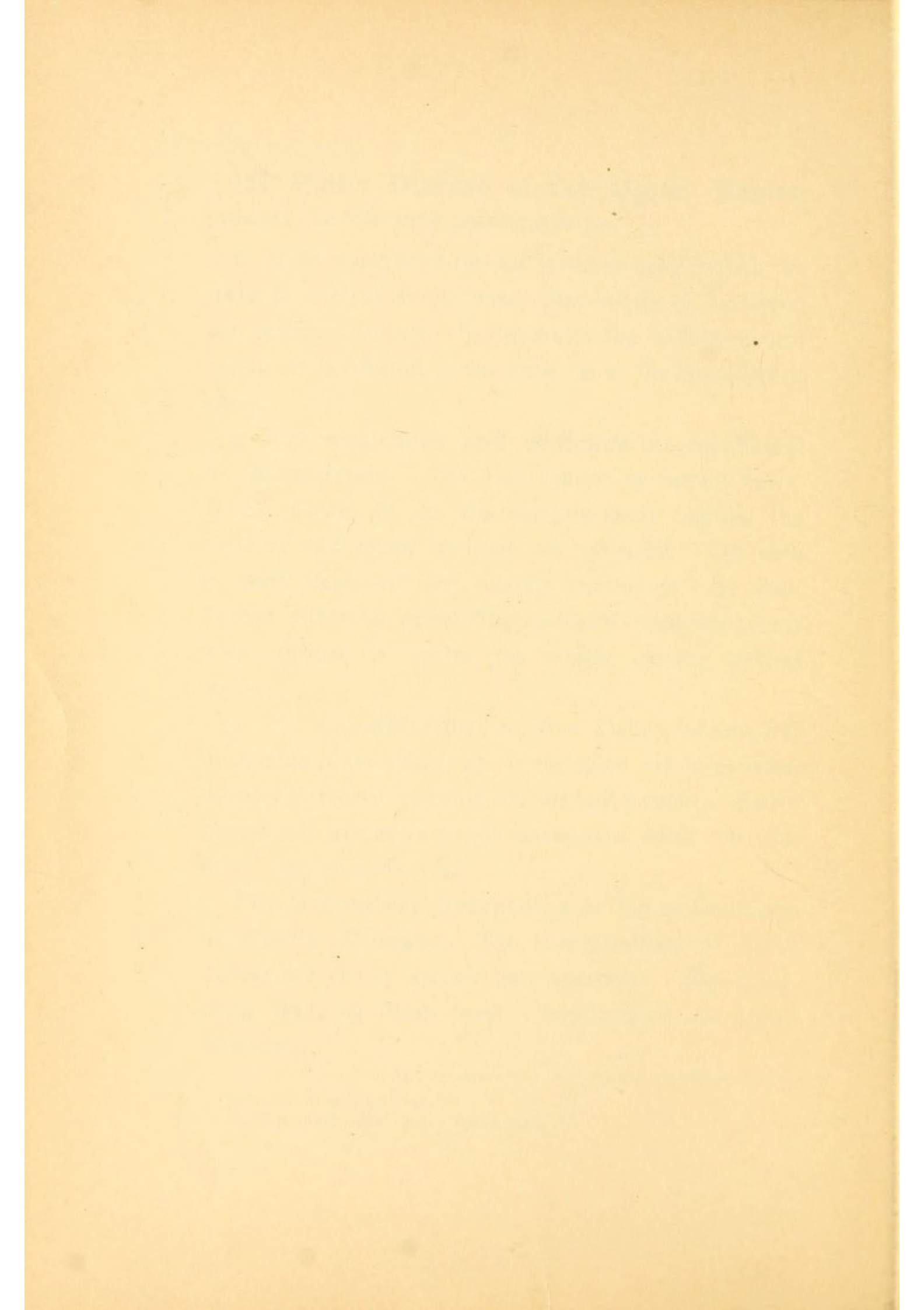
**The Secondary Symptoms or Complications of Pott's Disease.**—The complications of Pott's disease are chiefly abscess and paralysis. The symptoms resulting from these complications are styled secondary.

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\* Describe these distortions.

† Enumerate the other causes of wry neck.





**Paralysis.**—This is most often caused by pressure of the products of disease upon the cord and by interference with its circulation due to the thickening and infiltration of its coverings (pachymeningitis); occasionally it is caused by direct pressure of projecting bone or by the tumor of an abscess. The situation of the pressure regulates the extent of the paralysis, the typical form being a paraplegia. The effects of the interference with the function of the cord may be summed up by saying that the cerebral control of the parts below the constriction is checked, while the activity of the reflex centres below that point is increased. Sensation is more rarely affected, and, if so, to a lesser extent than are the motor functions.

The symptoms of Pott's paralysis are an awkward, stumbling gait, weakness, and finally an inability to stand. The lower limbs are "stiff" at times.\* The reflexes are increased. Control of the bladder may be retained, but often there is active incontinence, that is, the bladder empties itself from time to time. If the pressure is directly upon the reflex centres in the lumbar enlargement, there may be passive incontinence or dribbling of urine.† If the pressure is below the reflex centres, the bladder is not affected, and the symptoms of numbness and weakness resemble those caused by neuritis.‡

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\* Explain these effects.

† Explain these effects.

‡ Explain this effect.

**Abscess.**—It may be inferred that a limited collection of fluid is present in nearly every case, but only when it becomes of sufficient size to attract attention, is it classified as abscess.

In this sense abscess may be said to be present in about 25 per cent. of all cases of Pott's disease, and in at least 50 per cent. of the cases in which the lower region is involved. Abscess is much less frequent in the cases that have been carefully treated than in others. In the simple tuberculous ("cold") abscess there are no symptoms, other than those caused by its size or situation, but if infection takes place, constitutional symptoms appear. Such infection is infrequent before a communication with the exterior of the body is established. Abscess from disease of the atlo-axoid region often forces its way forward into the retro-pharyngeal space, or even upward into the cranial cavity. It is therefore a dangerous complication. Abscess from disease of the middle cervical region usually passes outward to the lateral region of the neck, appearing before or behind the sterno-mastoid muscles.

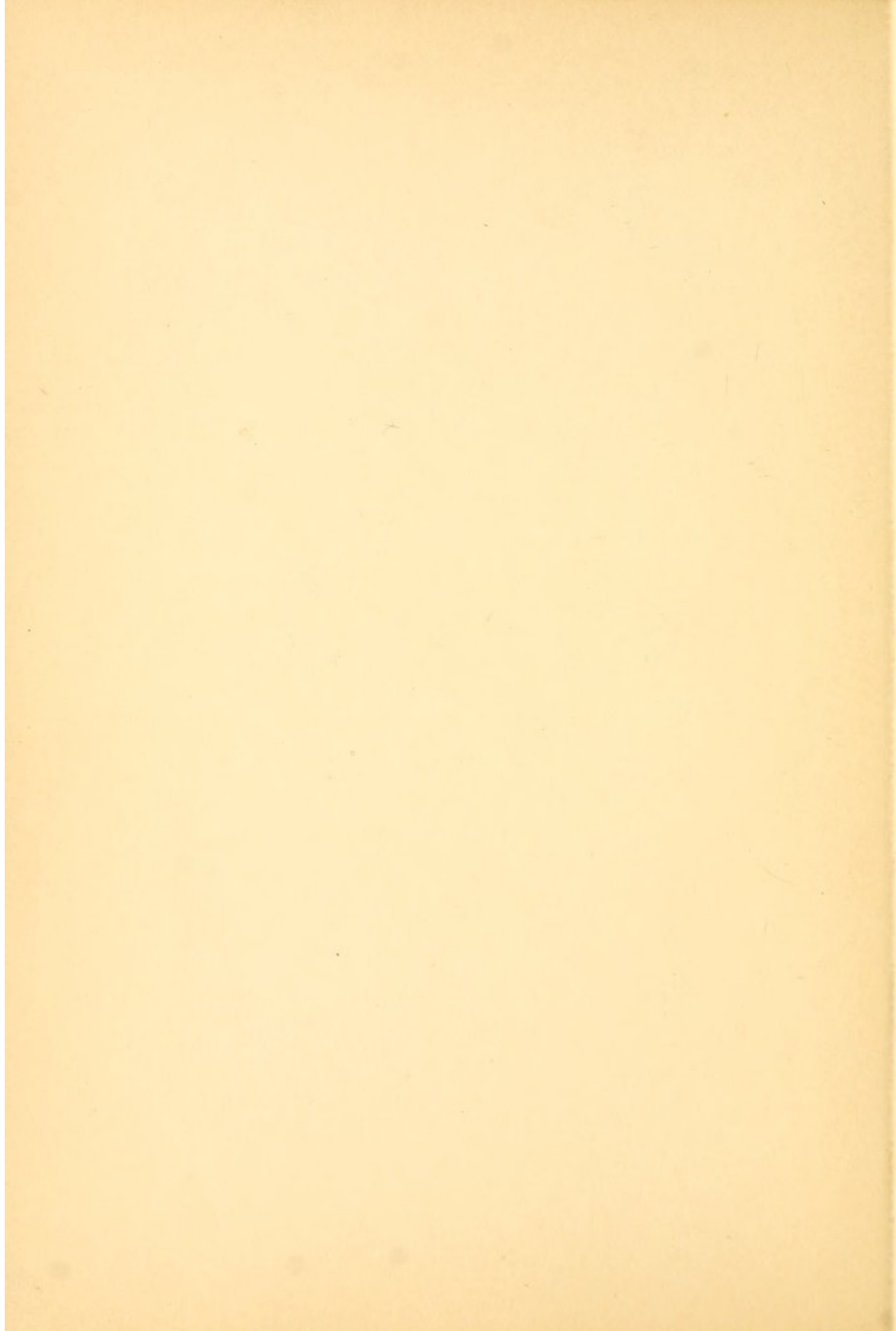
In dorsal disease the abscess usually enlarges in a lateral direction toward the chest wall, pressing aside the thickened pleura. Here its presence may be detected by auscultation or percussion. Most often it remains quiescent, but it may find an opening through an intercostal space, or it may pass downward through the











diaphragm, and become an iliac or lumbar abscess. If it form a tense tumor in front of the spine, it may obstruct respiration, but in ordinary cases it causes no symptoms.

In disease of the lumbar region the abscess, if superficial to the ilio-psoas muscle, may point in the neighborhood of the anterior superior spine, or pass through the inguinal ring. The true psoas abscess first distends the iliac region, and then, passing into the thigh, appears in Scarpa's space. In large abscesses of this character the pus may find an exit in the loin at the triangle of Petit, or in the gluteal region through the sacro-sciatic foramen.

In rare instances the abscess may find an opening within the body, and bursts into the lungs, the intestines, or elsewhere.

As a rule abscess causes but little difficulty in diagnosis, because it is a late symptom, appearing after the diagnosis of Pott's disease has been established. It is more often an early symptom in the upper and lower regions of the spine, but in any event, it is always accompanied by symptoms of the underlying disease of the spine.

DIFFERENTIAL DIAGNOSIS.\*—The various symptoms of Pott's disease, such as deformity, muscular spasm, abscess, and paralysis, may be mistaken for results of other affections. The **deformity** of tuberculous disease must be differentiated from the following affections, most of which are accompanied by **kyphosis**:

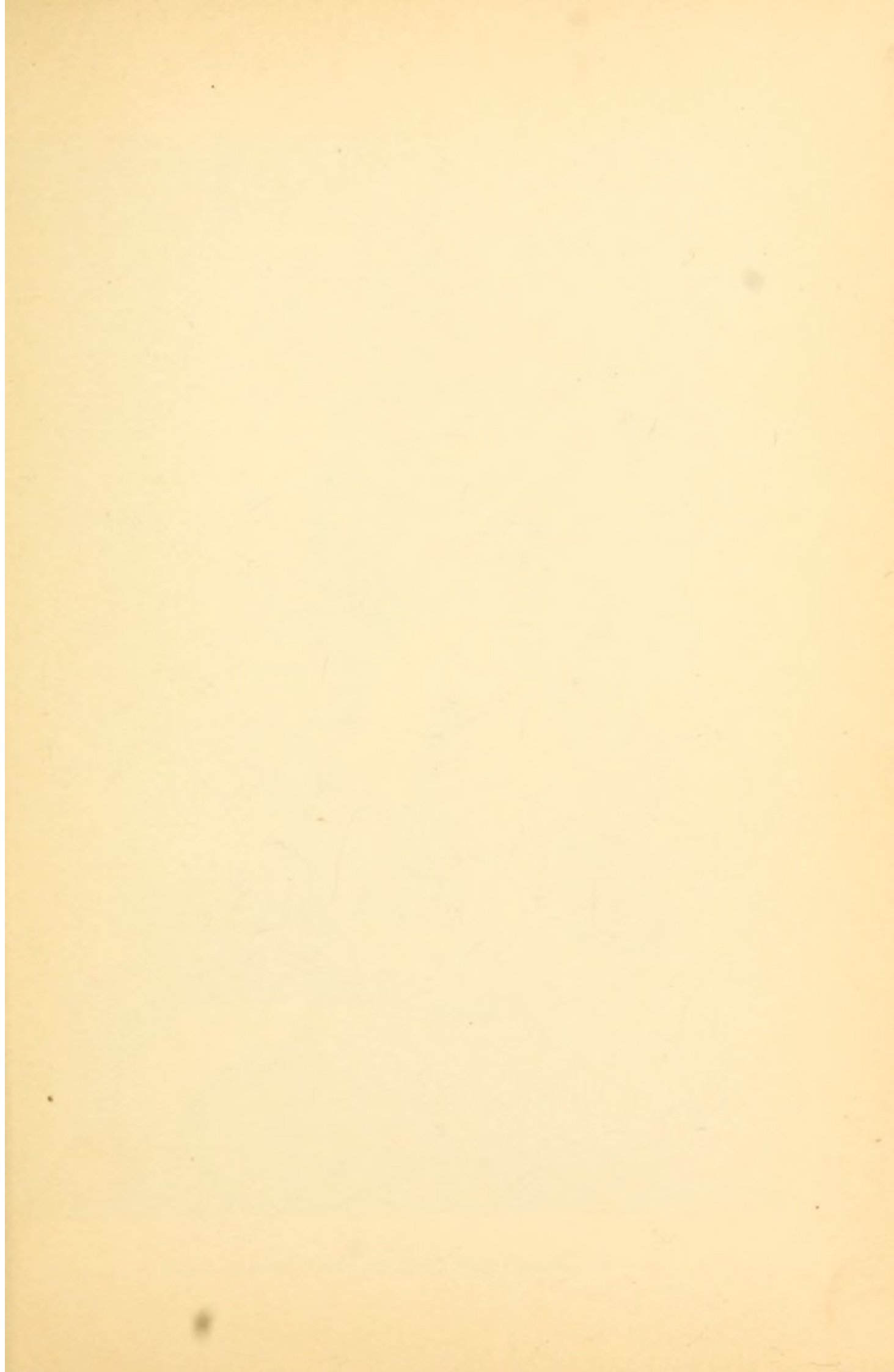
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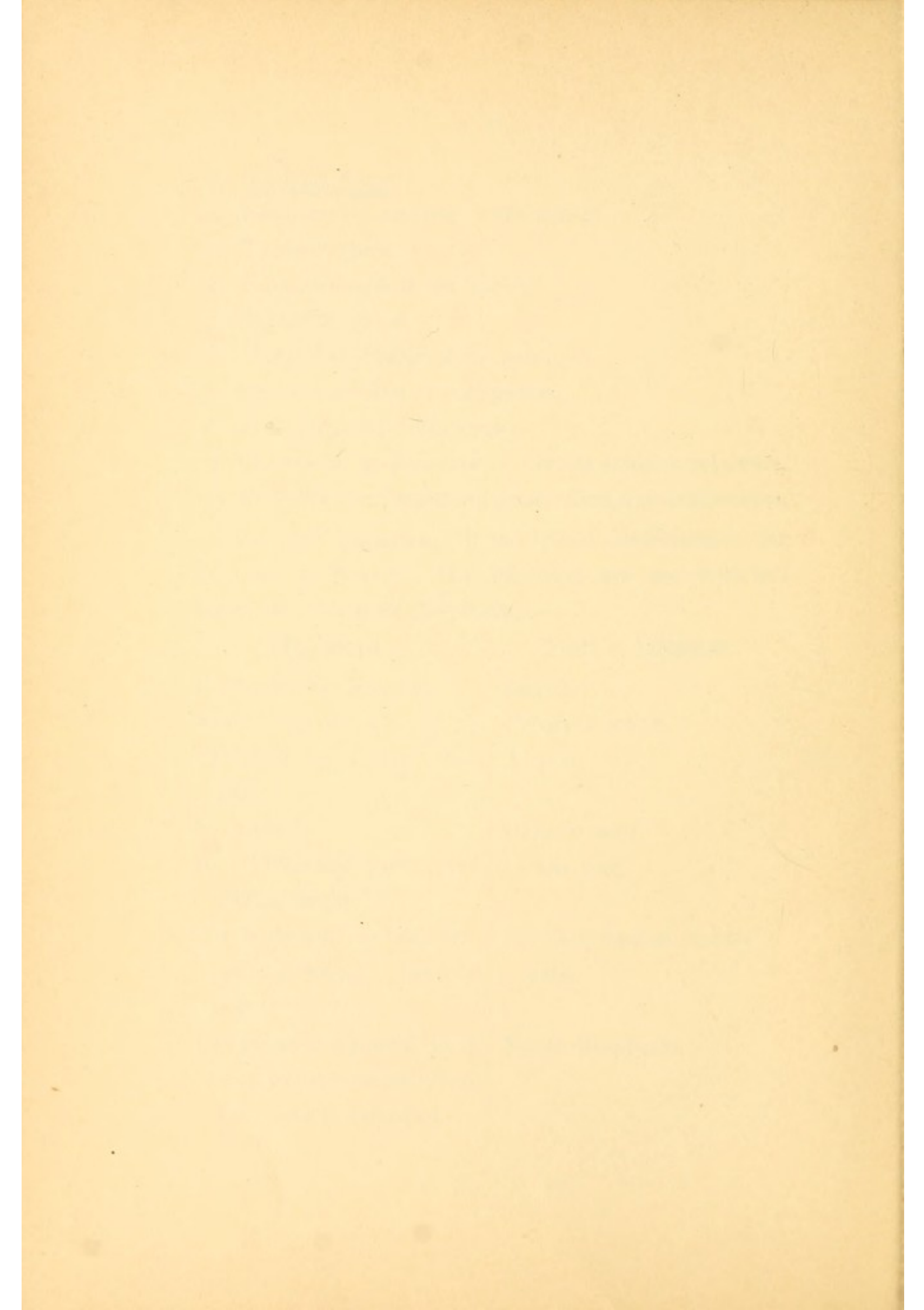
\* Whitman, the Elements of the Differential Diagnosis of Pott's Disease, *New York Polyclinic*, May, 1893.

1. Rachitic spine,
2. Rheumatoid arthritis of the spine,
3. Typhoid spine,
4. Neuromimesis of the spine,
5. Syphilitic spine,
6. Malignant disease of the spine,
7. Deformities due to occupation,
8. Fractures and dislocations,
9. Congenital prominence of certain spinous processes,
10. Presence of inflamed bursæ over the spinous processes.

The most important of the above conditions is the kyphosis of rickets. The following are the principal points in differential diagnosis :—

<b>Rickets.</b>	<b>Pott's Disease.</b>
Deformity not angular.	Angular.
Result of posture.	Result of lesion.
Evidences of rickets elsewhere.	Absent.
In infancy.	Usually later.
In middle and lower part of the spine.	In any part.
The body may be bent forward without discomfort.	Forward flexion causes pain.
The curve is lessened, or it may be obliterated when the trunk is extended.	Never disappears.





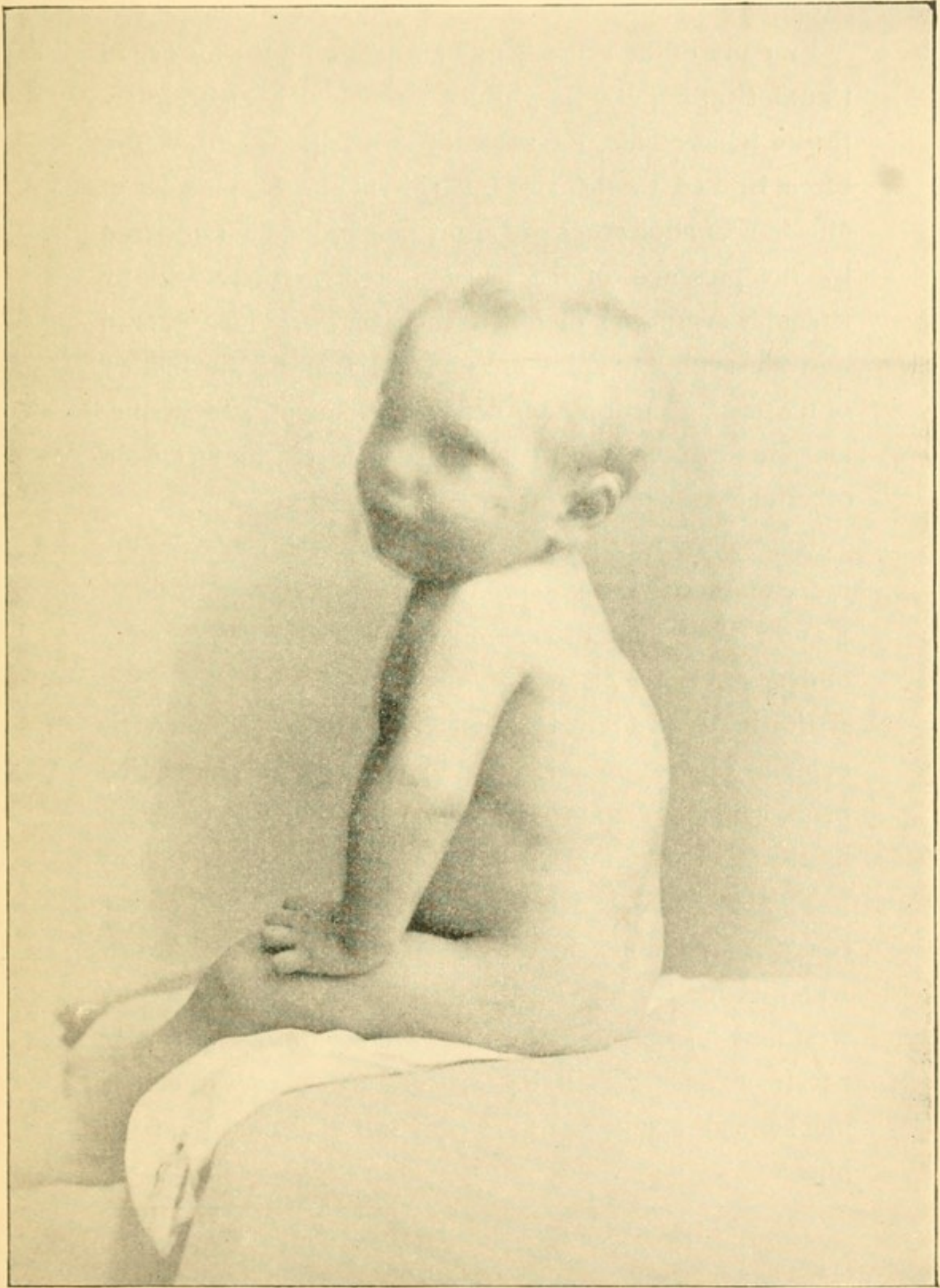


FIG. 8.—Rachitis Curve Simulating Pott's Disease. (Brown.)

Fracture of the spine is differentiated by the history of traumatism and by the sudden onset. Rheumatoid arthritis is, as a rule, a disease of adult life, and it is not often limited to the spine. The neurotic spine is an affection of adolescence or adult life, and is characterized by the presence of the neurotic temperament and by irregular symptoms of local sensitiveness. The typhoid and the syphilitic spine are differentiated by the history of the case. Occupation deformities occur late in life, and are of interest only when pain or discomfort from other causes is present.

In malignant disease the pain and the cachexia are more marked, and the symptoms are not relieved by treatment. Malignant disease of the spine is usually secondary to disease elsewhere.

Bursitis is a purely local affection, whose character is explained by examination and by the history. Congenital prominence of certain vertebræ can also be differentiated by the absence of the symptoms of disease.

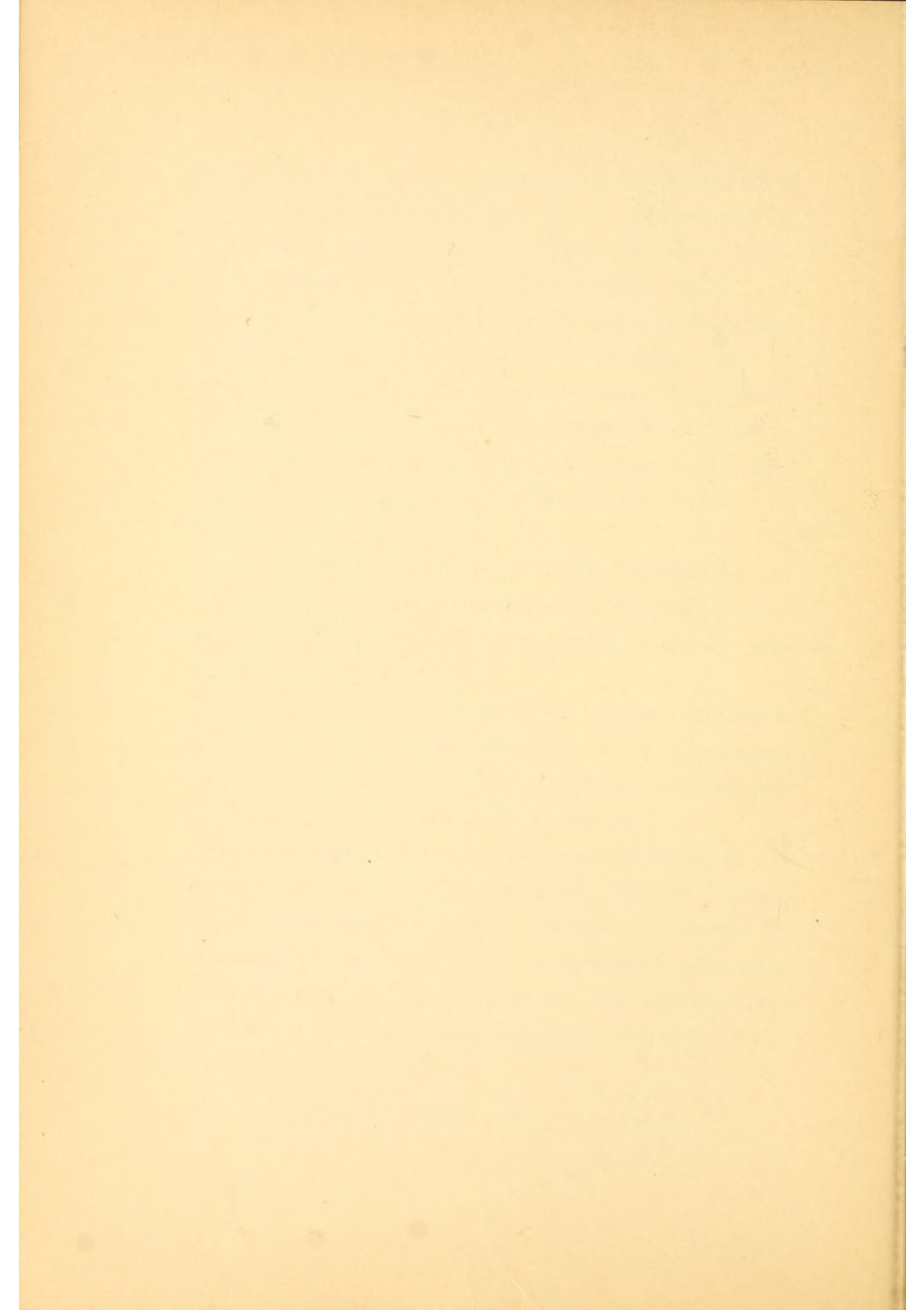
The **lordosis** which may be present in disease of the lower region must be distinguished from the lordosis which is due to other causes, for example, that caused by weakness of the muscles, as in pseudo-hypertrophic paralysis and the like; or from that explained by mechanical conditions as congenital dislocation of the hips.\*

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\* Explain the mechanism of these forms of lordosis.







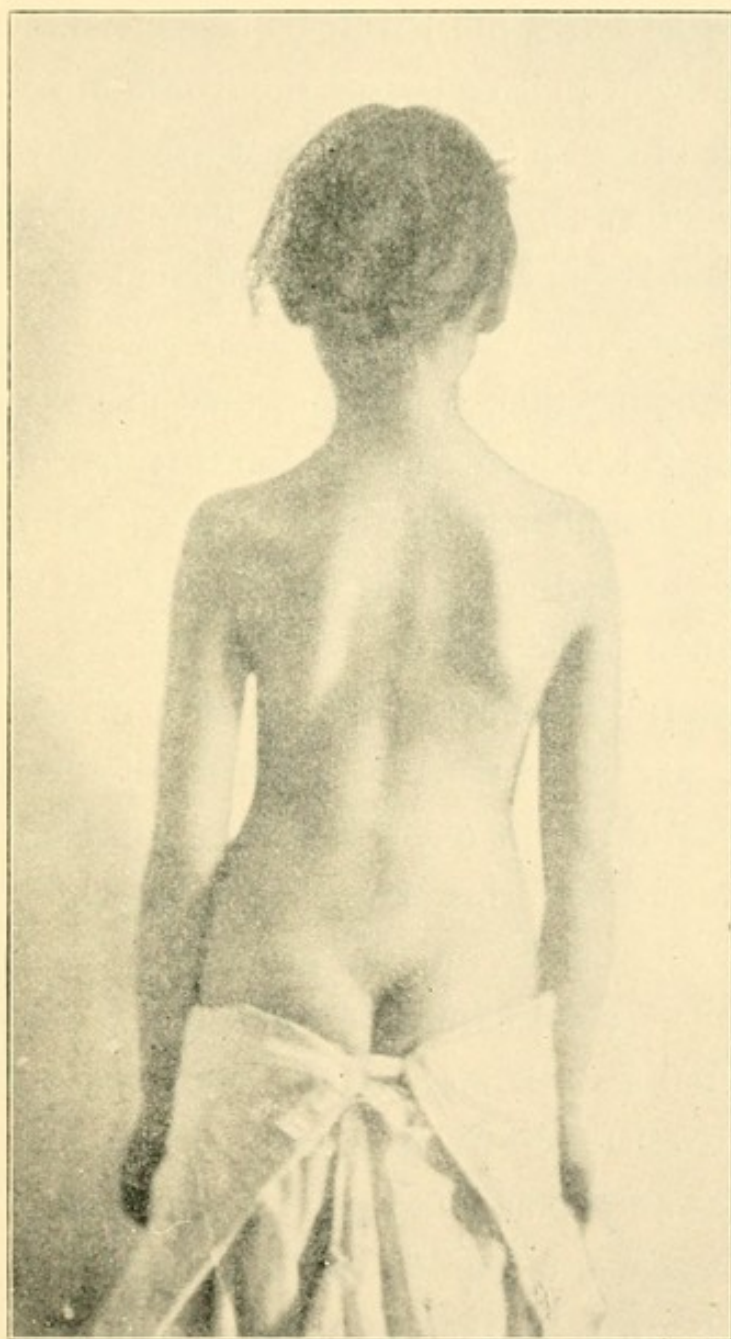
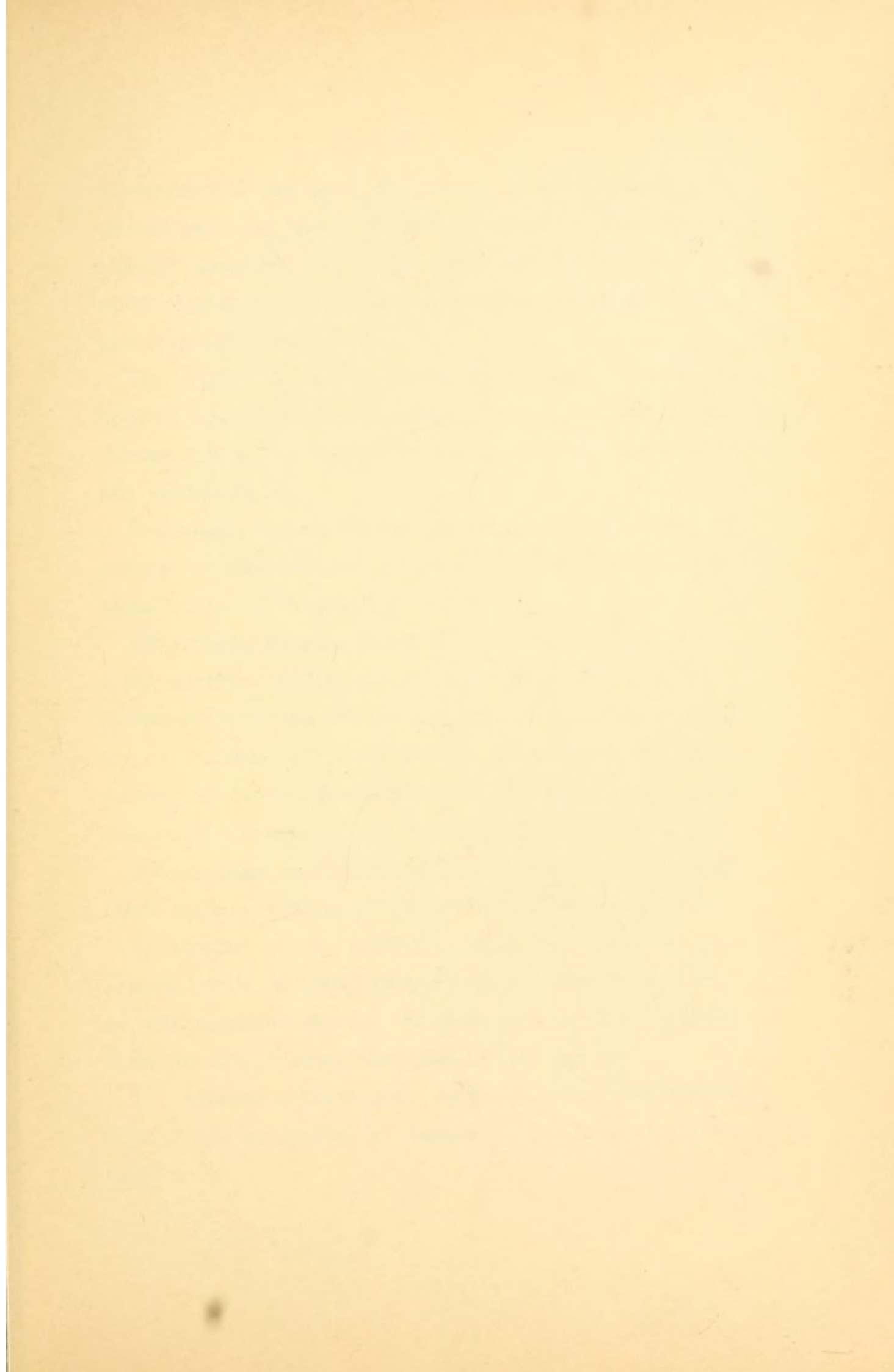


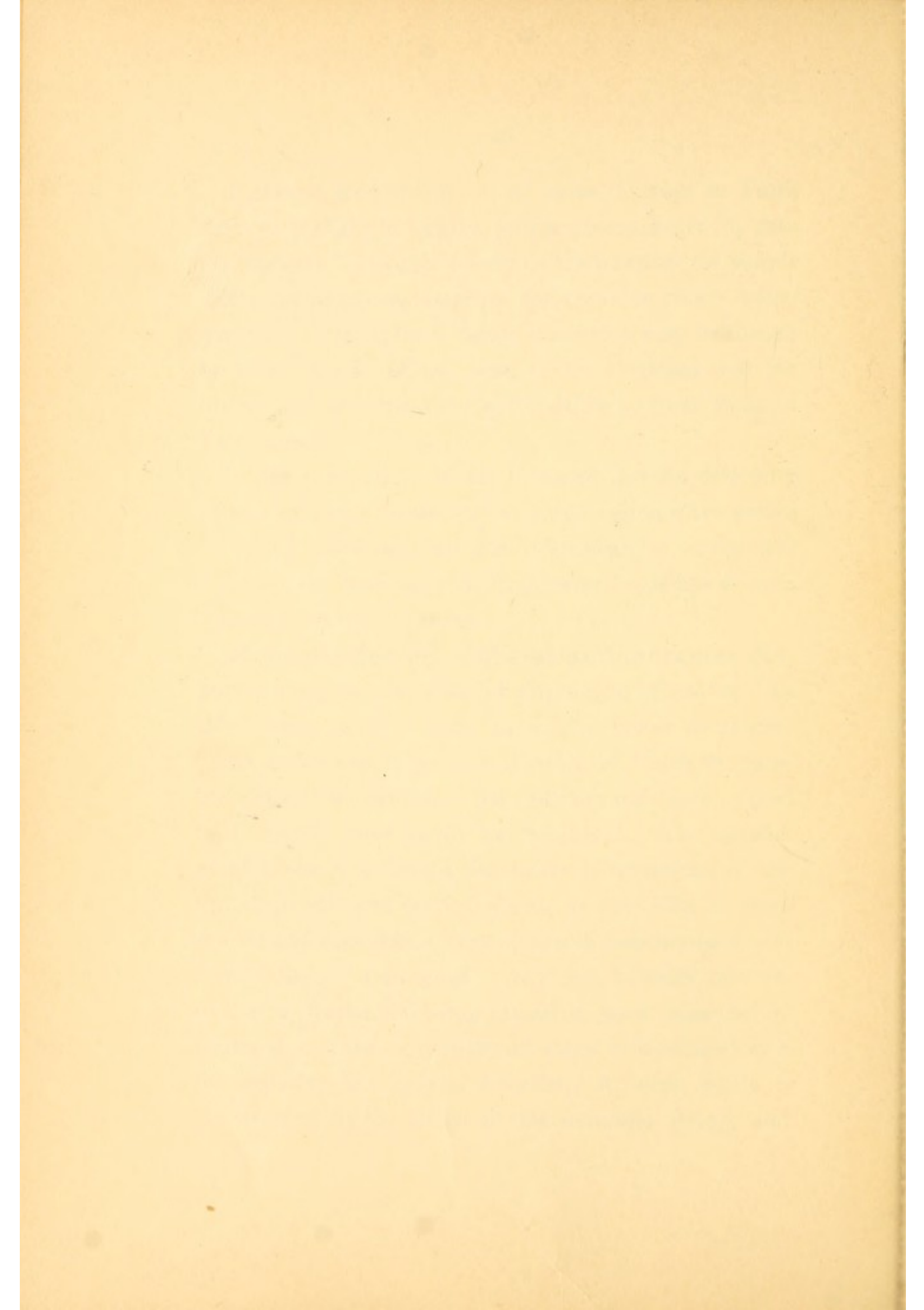
FIG. 9. — Pott's Disease in the Seventh Dorsal Vertebra, Mistaken for Lateral Curvature. (R. H. Sayre.)

**Lateral deviation** of the spine, as seen in Pott's disease, is slight in degree, and is accompanied by pain and rigidity. It could hardly be mistaken for the simple distortion which characterizes the common rotary lateral curvature of the spine. Slight distortion may be caused by acute disease of the lung or its coverings, but the history and symptoms are quite different from those of Pott's disease.

In this connection, it may be noted that the deformity caused by Pott's disease in the dorsal region often passes for round shoulders, and not infrequently it is the projection of the sternum, "chicken breast," that first attracts the attention of the patient.

**Muscular spasm, stiffness and muscular distortion** may be mistaken for a variety of affections. In the cervical region it often passes for simple torticollis. There are several forms of torticollis, of which the painless congenital form and the ordinary stiff neck, "cold in the neck," need hardly be considered. The spastic, painful, reflex torticollis, secondary to affections of the throat, to enlarged cervical glands, and the like, is, however, much more difficult to distinguish from the distortion due to disease of the spine. As a rule, however, the distortion of torticollis, being caused in most instances by contraction of the sterno-mastoid alone or combined with the trapezius, is a regular deformity; in other words, it is explained by the action of this muscular group, and





movements of the head, that do not draw upon the contracted part, are free. In Pott's disease the distortion is usually irregular, not to be explained by simple muscular contractions, and motion is limited in all directions and it causes discomfort.

The history is also of importance:—reflex torticollis appears suddenly, “in a single night,” while in Pott's disease it is a later symptom, slight at first, and gradually increasing.

Rheumatic disease of this region, usually a sequel of general rheumatism, is explained by the history. The same is true of traumatism.

**Muscular contraction** in the lower region of the spine, causing flexion of the thighs and a limp, is often mistaken for disease of the hip joint. If the tension of the contracted ilio-psoas muscle be relaxed, the other movements of the hip will be free and painless, while in hip disease all the motions are restricted by muscular spasm.

**Abscesses** complicating Pott's disease may be mistaken for suppurative processes due to other causes.

I. Abscess of the cervical region must not be confounded with the symptoms of enlarged tonsils, adenoids, or with so-called croup. It must also be distinguished from the simple acute abscesses of this region.

II. Abscess of the thoracic region is to be distinguished from those secondary to disease of the lung or of the chest wall.

III. Abscess in the loin or inguinal region may be mistaken for the acute or chronic abscess due to:—

- |                             |   |                                                                                                                                                                                                                      |
|-----------------------------|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Perinephritis,           | } | These are usually of acute onset and are accompanied by constitutional disturbance. There may be secondary rigidity of the spine, but no deformity, as is usual in Pott's disease at the stage of abscess formation. |
| 2. Perityphlitis,           |   |                                                                                                                                                                                                                      |
| 3. Sacral or Iliac disease, | } | The symptoms of Pott's disease are lacking.                                                                                                                                                                          |
| 4. Herniæ.                  |   |                                                                                                                                                                                                                      |

The **paralysis** of Pott's disease must be distinguished from

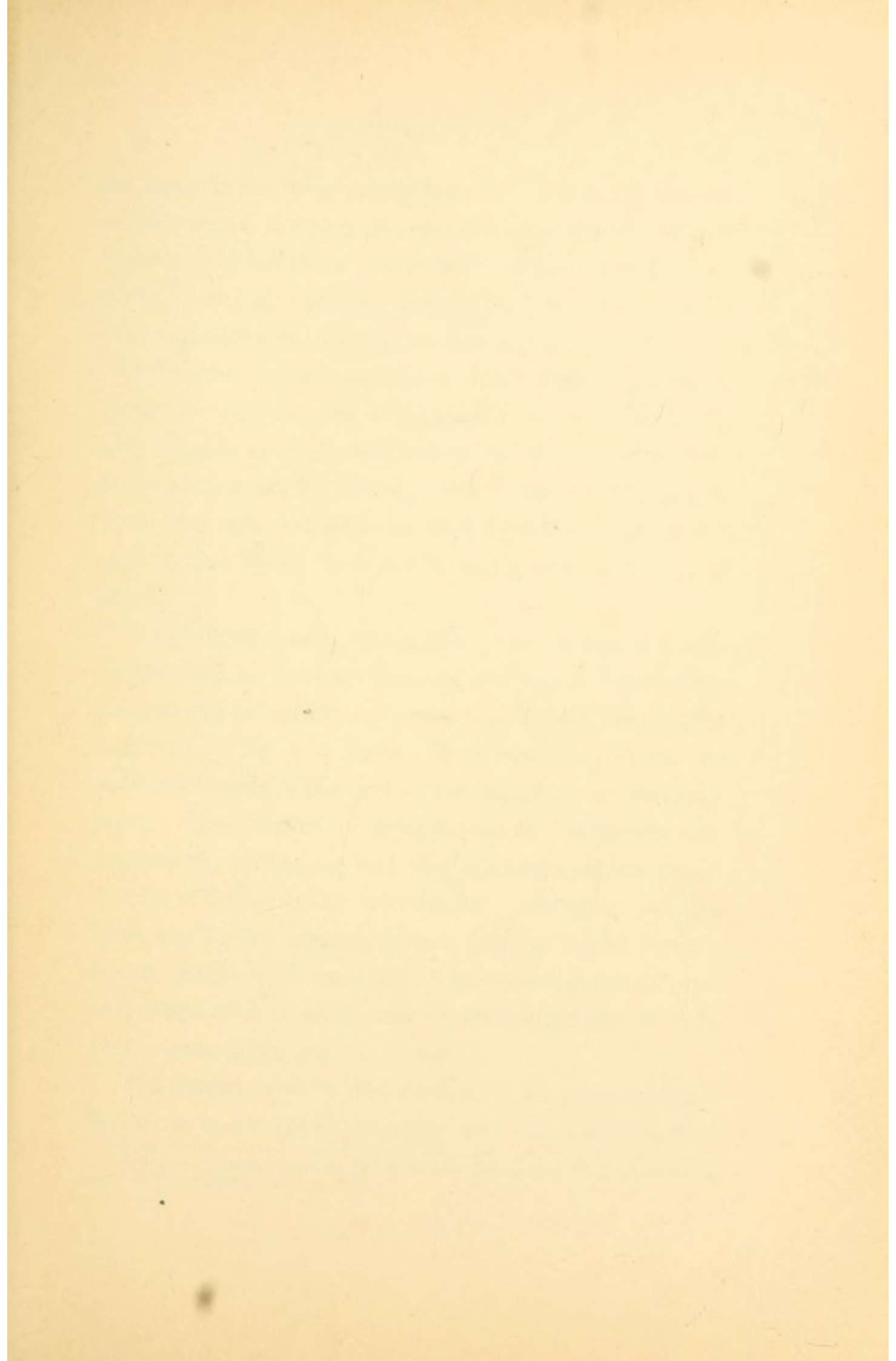
1. Simple weakness,
2. Injury to the cord,
3. Tumors of the cord,
4. Syphilitic disease of the cord.

The **weakness and stiffness** caused by Pott's disease in the lower region may be simulated by lumbago, rheumatism, sciatica, and by the effect of injury or strain. Lumbago, rheumatism and sciatica are uncommon in childhood. They are usually of sudden onset. Sciatica is usually unilateral; the pain of Pott's disease is usually bilateral. Strains and other injuries have, as a rule, a well-defined history.

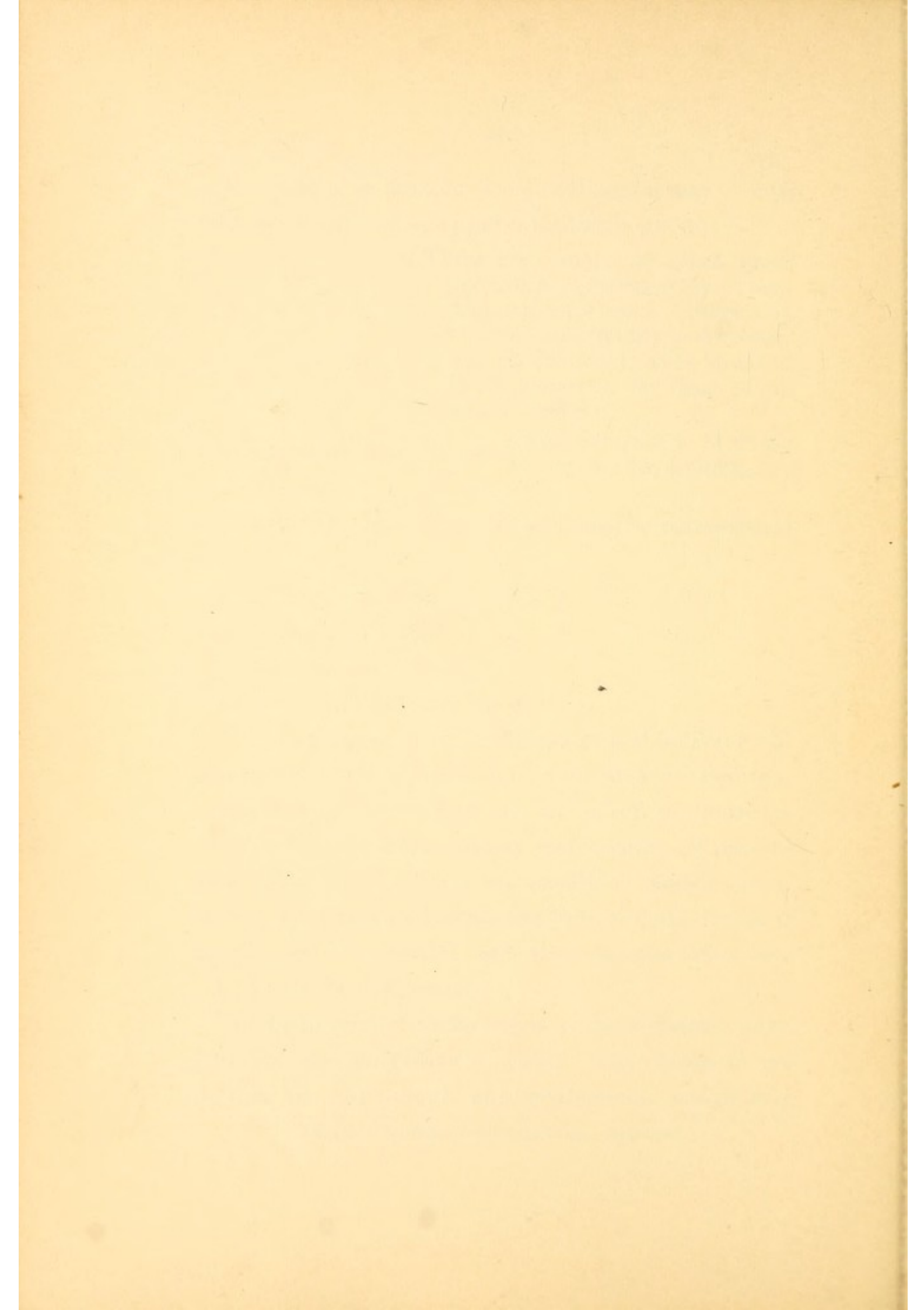
The **pain** referred to the region of the stomach is often mistaken for indigestion or colic. The change in the rhythm of respiration\* and symptomatic cough may

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\* Explain the significance of grunting respiration?







be mistaken for lung complications. When the disease is more acute, the pain and the lateral inclination of the body may be mistaken for pleurisy or pneumonia, especially if abscess be present, causing dullness on percussion with accompanying friction sounds or râles.

PROGNOSIS.—The prognosis of Pott's disease, although always uncertain owing to the gravity of the disease itself, and of many of its complications, is by no means bad. It depends upon the location and extent of the lesions, upon the age, constitution and circumstances of the patient, and upon the character and quality of the treatment.

The prognosis as to **duration** may be stated to be, on the average, between two and five years. Practically, no case can be considered cured that has not been under observation for five years. It is well to inform the patient's friends of this fact at the beginning of the treatment. The **causes of death** may be exhaustion after prolonged suppuration and amyloid degeneration, tuberculosis of other organs, tuberculous meningitis, and the like; and in rare instances death may be caused directly by an abscess or by paralysis. The weakness and deforming effects of the disease must be recognized also as indirectly influencing the death-rate.

The prognosis as to **deformity**.\* In general, this is far better in disease of the upper and lower regions than

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\* Whitman: Observations on the Ultimate Deformities of Pott's Disease, etc. *Medical News*, Nov. 19, 1892.

when the middle of the spine is affected. In the latter case the entire column may enter into the formation of the "hump," while the opportunity for extensive distortion is lacking when the extremities of the spine are involved.\*

In the lower region the trunk is shortened, the abdomen is retracted, and the ribs come into contact with the pelvis. In the upper region the deformity causes a thrusting forward of the head and a short neck, but these effects are far less noticeable than the characteristic distortion in disease of the thoracic region.†

There is also a dwarfing, blighting effect of the disease, distinct from actual deformity. This is most marked when the disease begins at an early age and is prolonged.

As has been stated, the prognosis as to deformity is greatly influenced by the character of the treatment. Deformity may be prevented, but that which represents actual destruction of tissue cannot be remedied. Muscular distortions may cause extreme deformity if they are neglected, but, as a rule, they may be corrected or prevented.‡

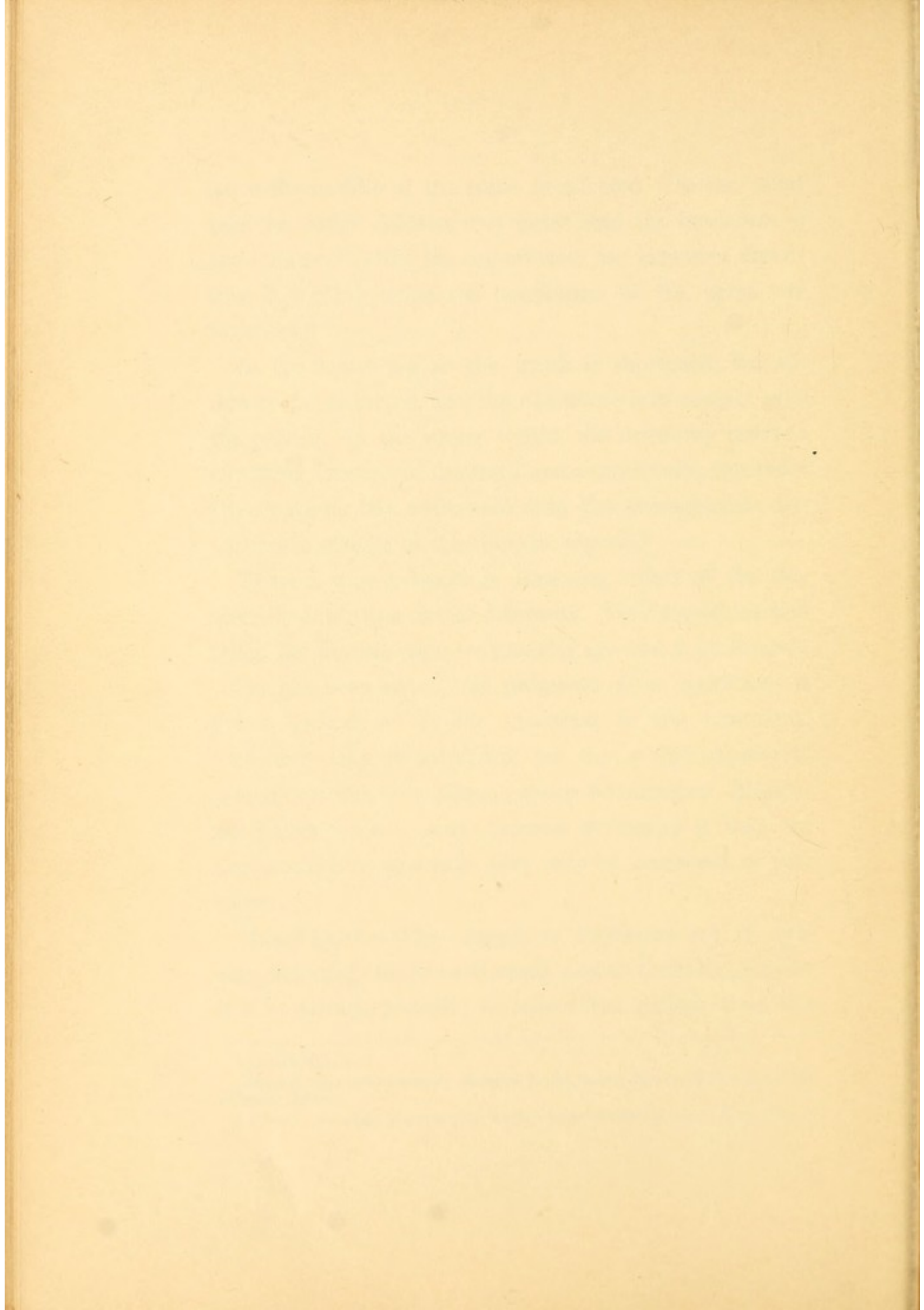
TREATMENT.—The objects of treatment are to prevent deformity in the early cases, and to arrest its progress if it be already present ; to relieve the patient from the

\* Explain this fact.

† Describe the compensatory changes in the spine, due to deformity of the different regions.

‡ What is the effect of permanent flexion (contraction) of one or both thighs?





depressing influences of pain and discomfort ; and finally, to so improve the general condition, that the disease may be overcome by the natural forces.\*

It may be stated that the treatment which efficiently checks and prevents deformity will fulfill the other indications. Deformity is the direct result of disease, but the course of this disease and its deforming effects are influenced by many conditions; for example, by the force of gravity and by the movements of the patient, by strain and injury. In other words, pressure and even friction may increase the activity of the local process.

Direct removal of the disease by surgical intervention being impracticable, one must depend upon the influence of local rest to favor repair and to relieve the symptoms.

It will be evident, then, that the most perfect rest can be attained by fixing the body in the horizontal position, as only in this attitude can the influences of weight and strain be removed; but as the course of the disease is so long, and as a certain amount of functional activity which does not overtask the weak part, is an important adjunct in treatment,\* this complete rest is indicated rather for the treatment of special phases of the disease than as a routine.

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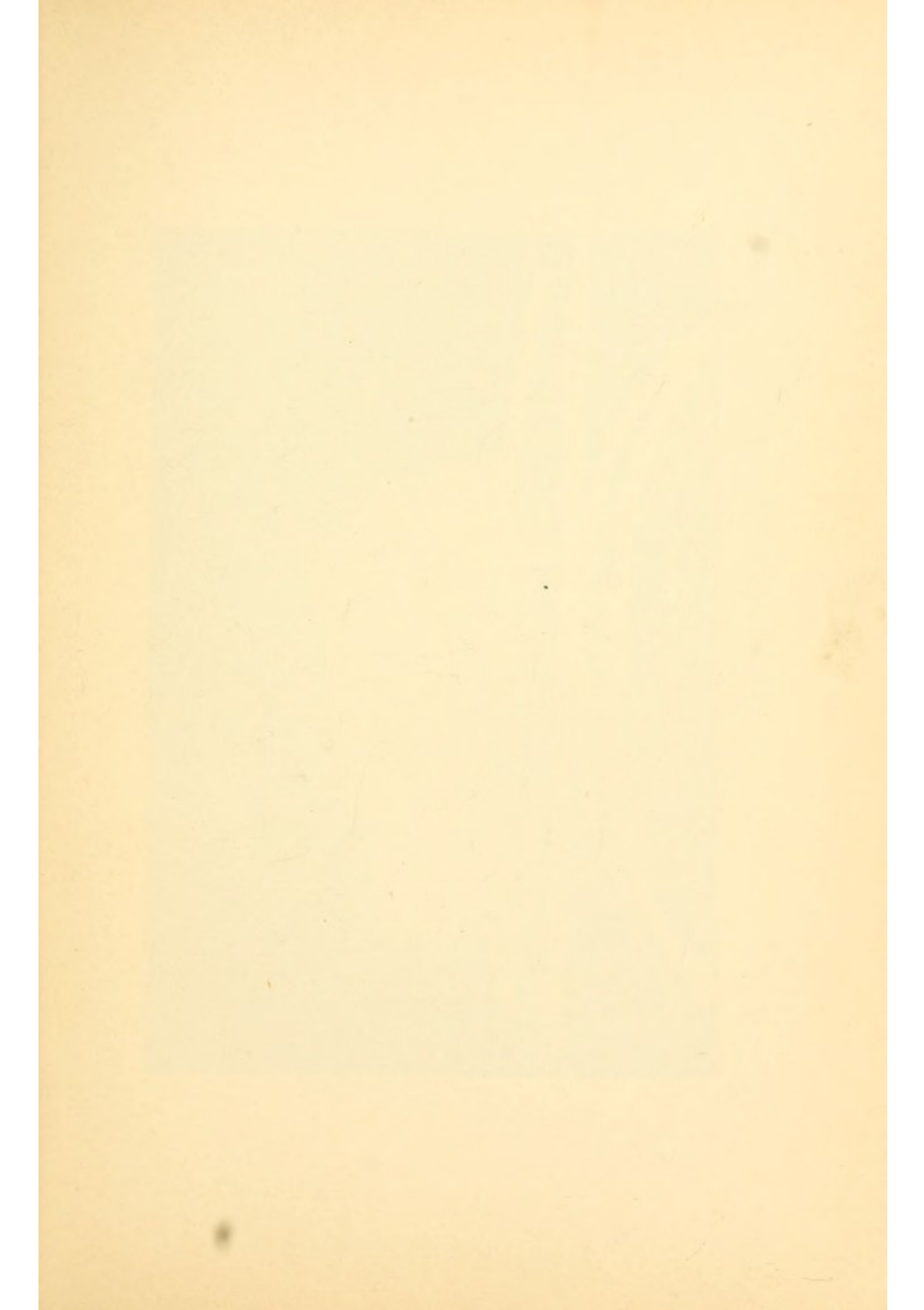
\*Whitman: Observations on Pott's Disease with Reference to the Principles of Treatment and their Application. *New York Medical Journal*, Oct. 28, 1893.

**Horizontal fixation** may be most conveniently applied by means of the Bradford stretcher splint, a parallelogram of gas pipe, or better, of light steel pipe. This is made a little longer than the body, and slightly wider. The frame is covered with canvas, laced or strapped tightly about the bars to make it rigid, and further strengthened by straps if sagging is perceptible. The centre of the cover is protected by a sheet of rubber, or an opening to allow for the use of the chamber may be provided. Beneath the kyphosis, on either side of the spine are placed two pads to protect the spinous processes from pressure and to assure better fixation. Upon this frame the child, wearing a shirt only, is fixed by means of an apron or swathe. In some instances the head must be fixed, or the movements of the arms or thighs must be restrained, or extension must be applied to the head or legs, according to the situation of the disease.\*

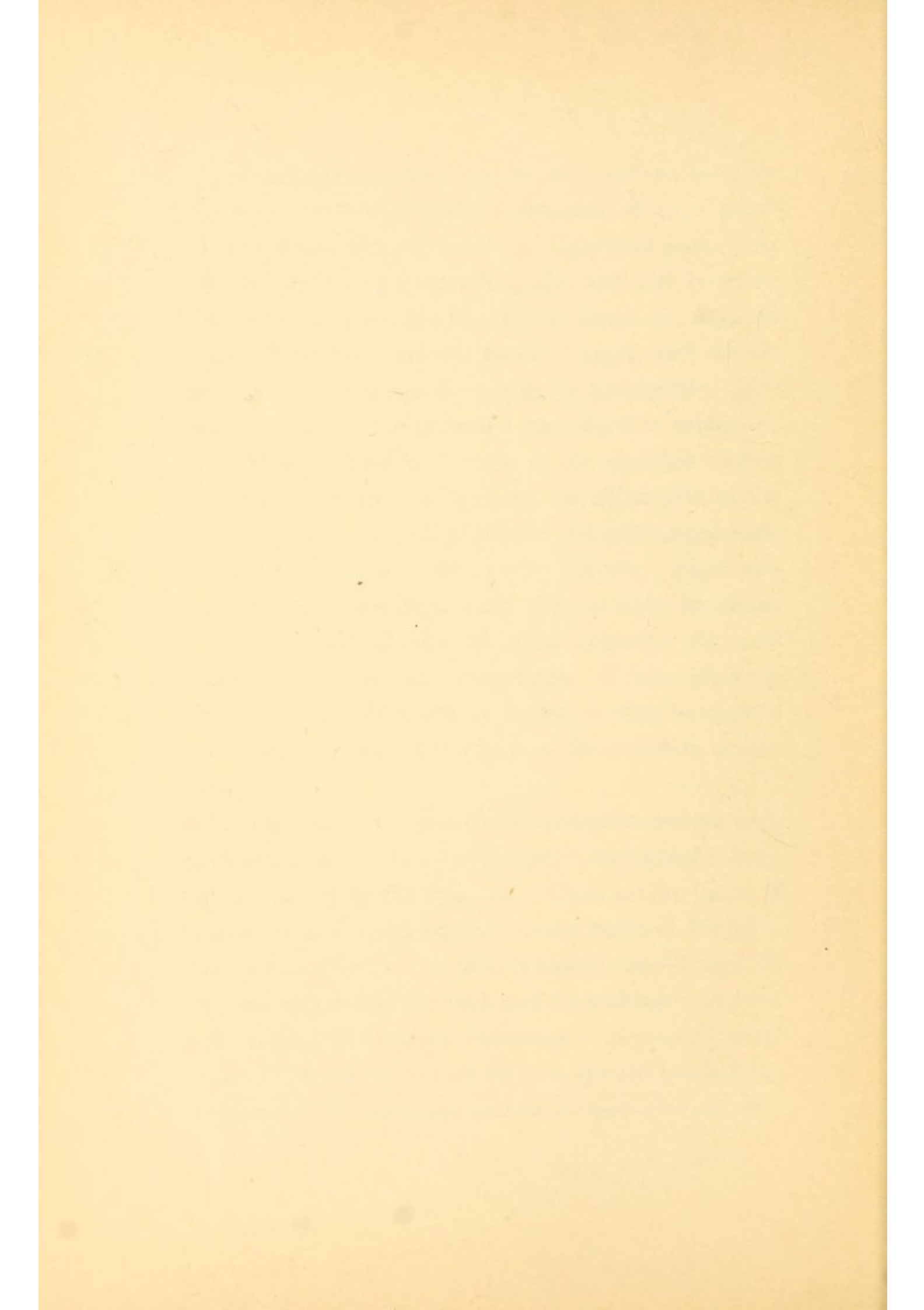
The clothing is made sufficiently large to include both splint and patient. If suitably clad, it may spend a large part of the day in the open air. Once on the frame, it is never allowed to sit up until this portion of the treatment is completed. The child is simply turned upon its face for inspection of the back and for bathing. As soon as the patient has become accustomed to the appliance, the bars are bent from time to time upward beneath the

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\* What are the indications for these measures, and how are they applied?







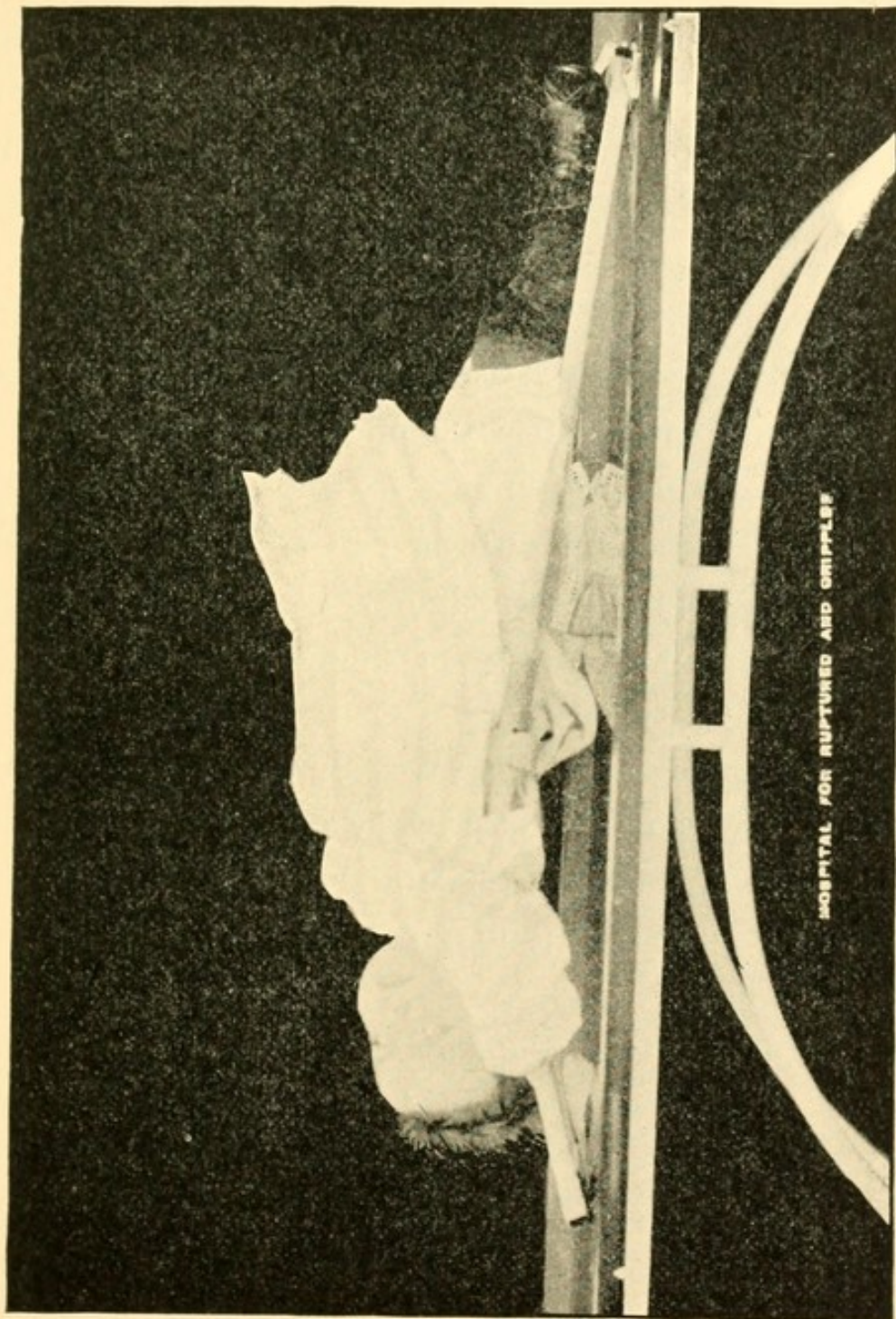


FIG. 10.—Bradford Frame, Showing Child in Position and Frame Bent to Suit Requirements of the Case.

kyphosis with the aim of producing over-extension of the back, and thus slowly reducing the deformity.\*

Horizontal fixation should be the treatment of routine in infancy and very early childhood.† It is the treatment of selection for emergencies in late childhood, for rapidly increasing deformity, for acute symptoms, paralysis, and the like.

**Ambulatory Supports.**—Ambulatory supports are splints designed to fix the spine, if possible, in an extended position, so that the pressure may be removed from the seat of disease, and that the super-incumbent weight may be supported in part by the lateral and posterior portions of the column.

Two forms of support are in common use,—the plaster jacket and the spinal brace.

The principles of application are identical, and each may be efficacious if it be properly applied and if the disease is so situated as to allow for efficient splinting. Each has advantages and disadvantages which become apparent on use.

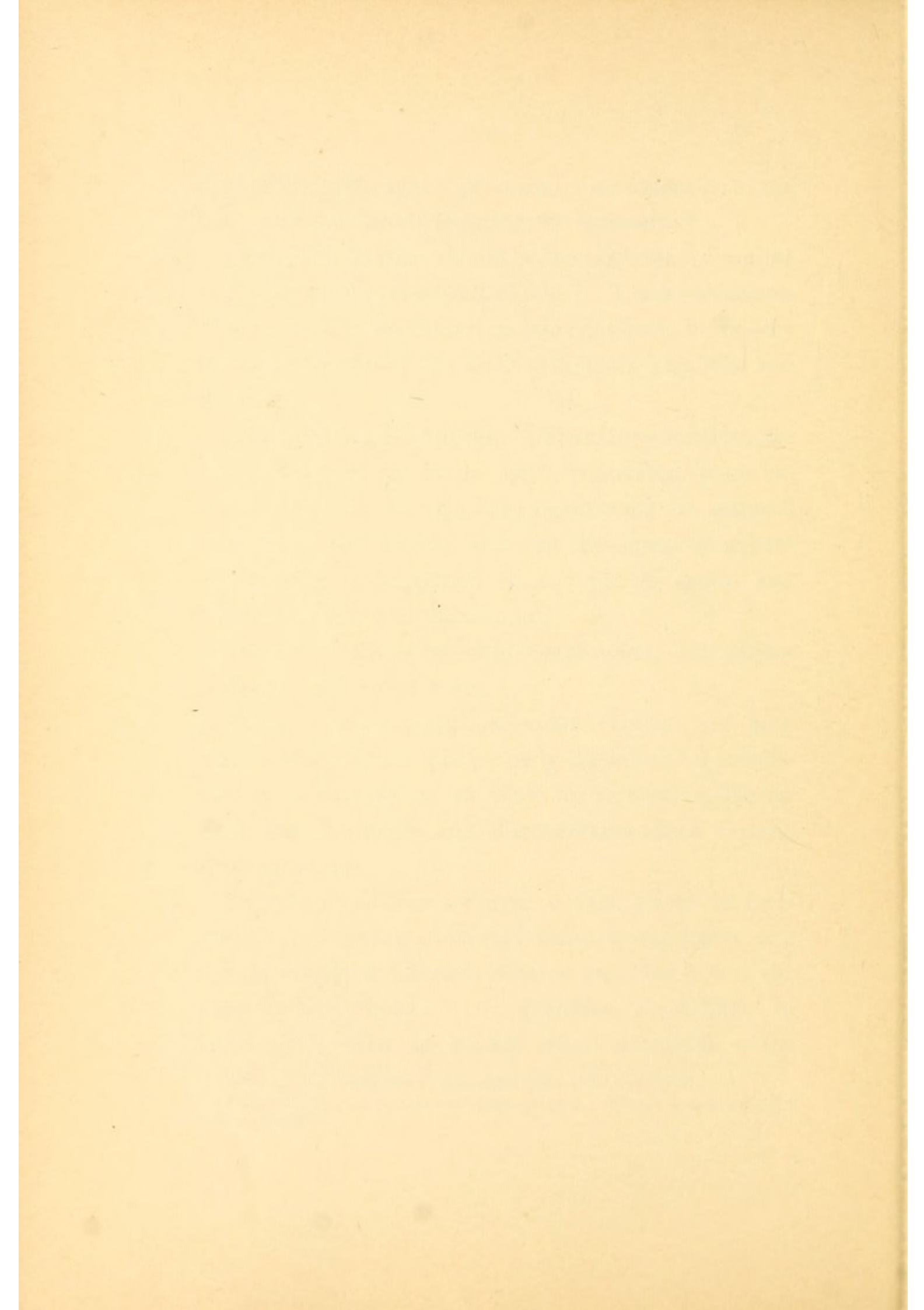
The plaster jacket is a simple circular plaster of Paris splint. It must be supported below by the pelvis, and it must extend a sufficient distance on either side of the point to be splinted. It is, therefore, more likely to be of service when the disease affects the middle of the

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\* What are the indications for discontinuance of this treatment?

† Enumerate the advantages and disadvantages. Why is it unsuitable for older patients?





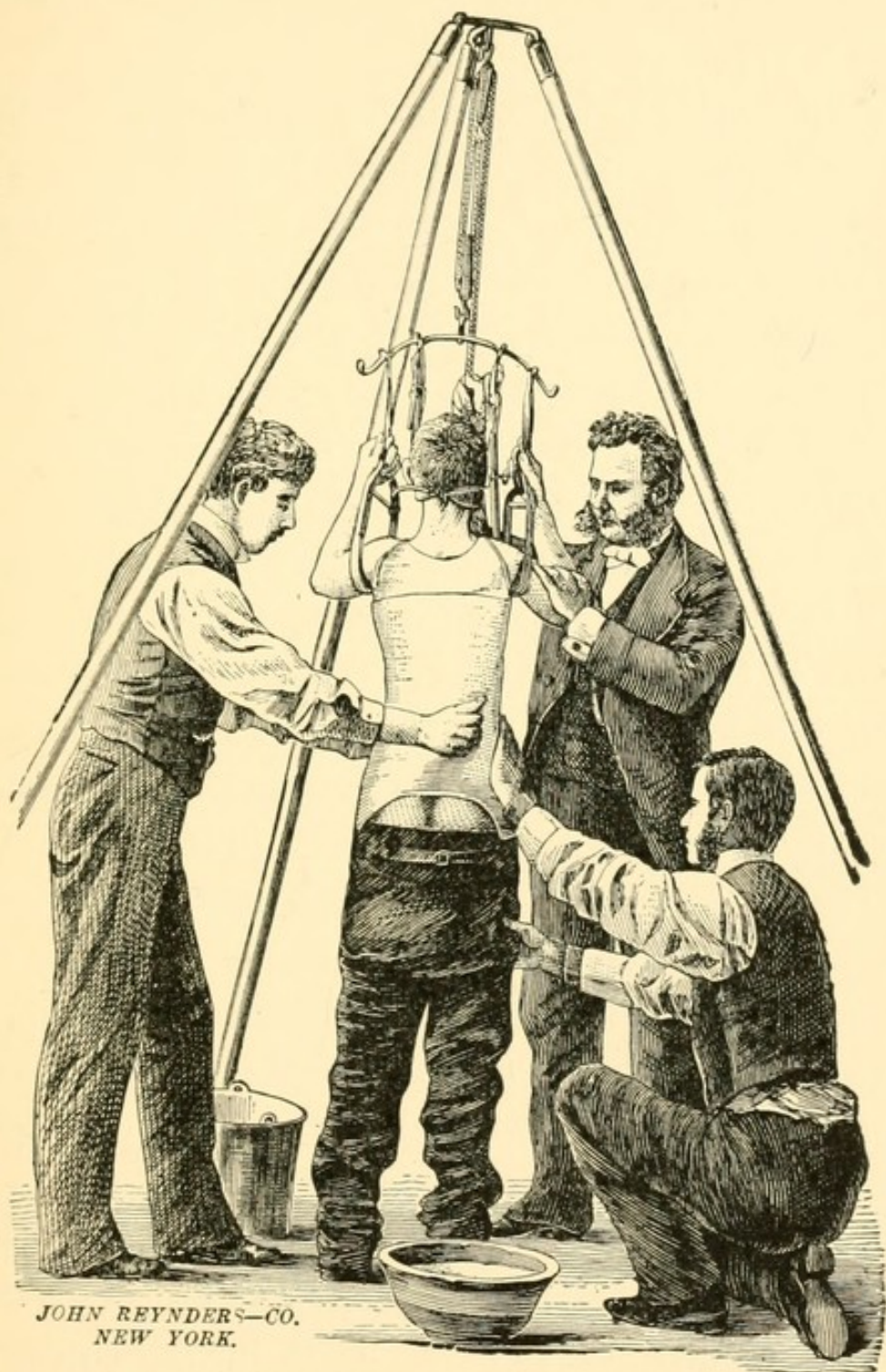


FIG. 11.—Dr. Sayre's Original Illustration of the Method of Applying a Plaster Jacket. The axillary supports are not usually employed at the present time.

trunk, and it is particularly adapted for patients who have passed earliest childhood.

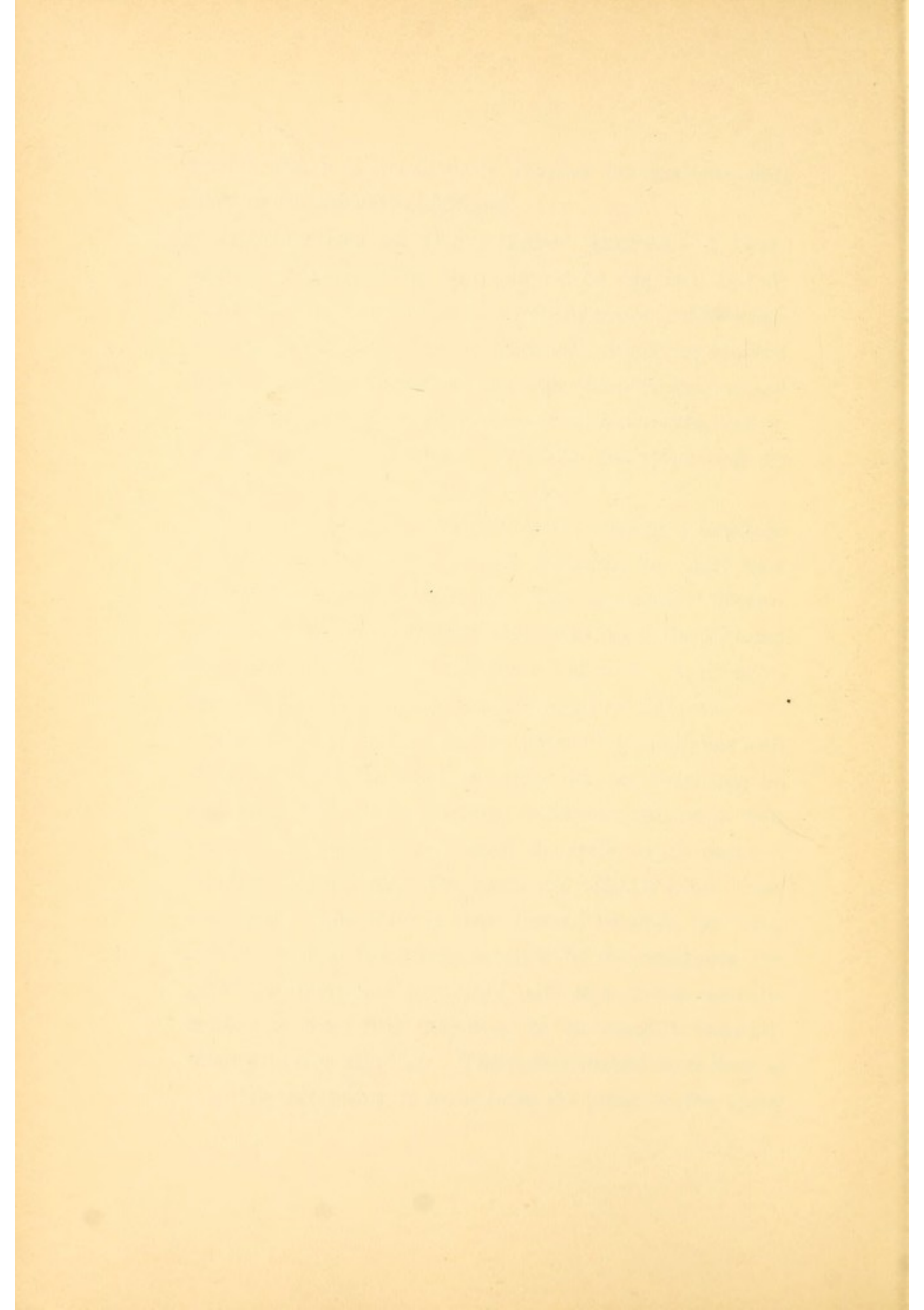
**Application of the Plaster Jacket.**—A long, seamless, tightly fitting shirt should be applied, and all bony prominences should be carefully protected by strips of felt. Two pads of extra thickness should be applied on either side of the projecting spinous processes, at the seat of the disease, to protect them from pressure, and to provide a certain leverage by which the spine may be straightened and fixed at this point.

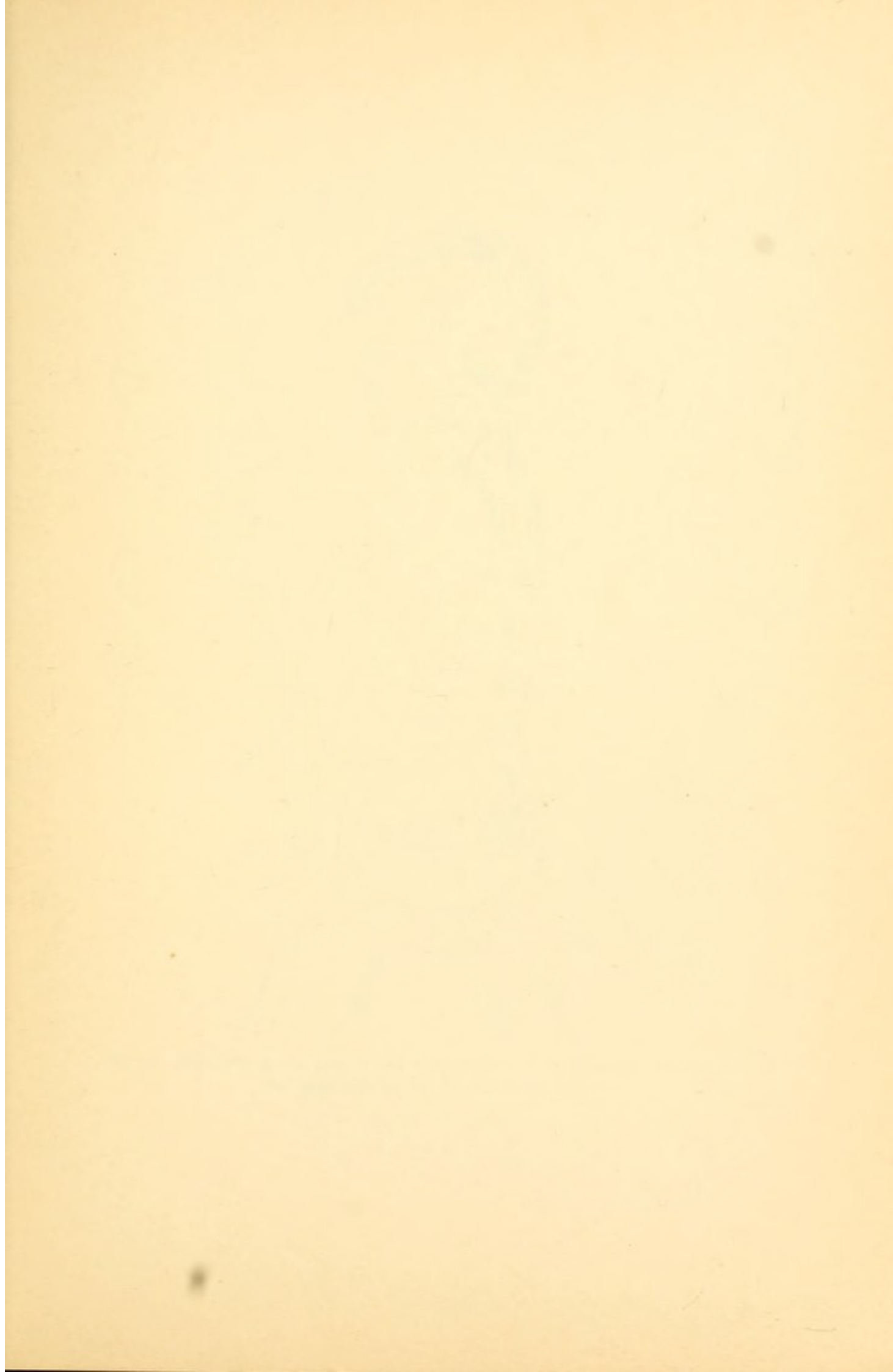
In some instances, a folded towel to which a bandage is attached, may be inserted beneath the shirt and placed just below the sternum. This so-called "dinner-pad" is to be removed later, thus assuring the additional space that may be required after a full meal. It is, however, rarely necessary in the treatment of children.

The patient is placed in the suspending appliance with the arms above the head, in order that the chest may be expanded as much as possible. Sufficient tension is then made upon the rope to extend the spine to the point of comfort, usually until the heels are slightly lifted from the stool. The shirt is then pinned between the legs, and the patient being held steadily by the assistants, the bandages are applied smoothly, each layer being carefully rubbed in order that they may be thoroughly incorporated with one another. The jacket should be as long as possible, extending in front from the pubes to the upper











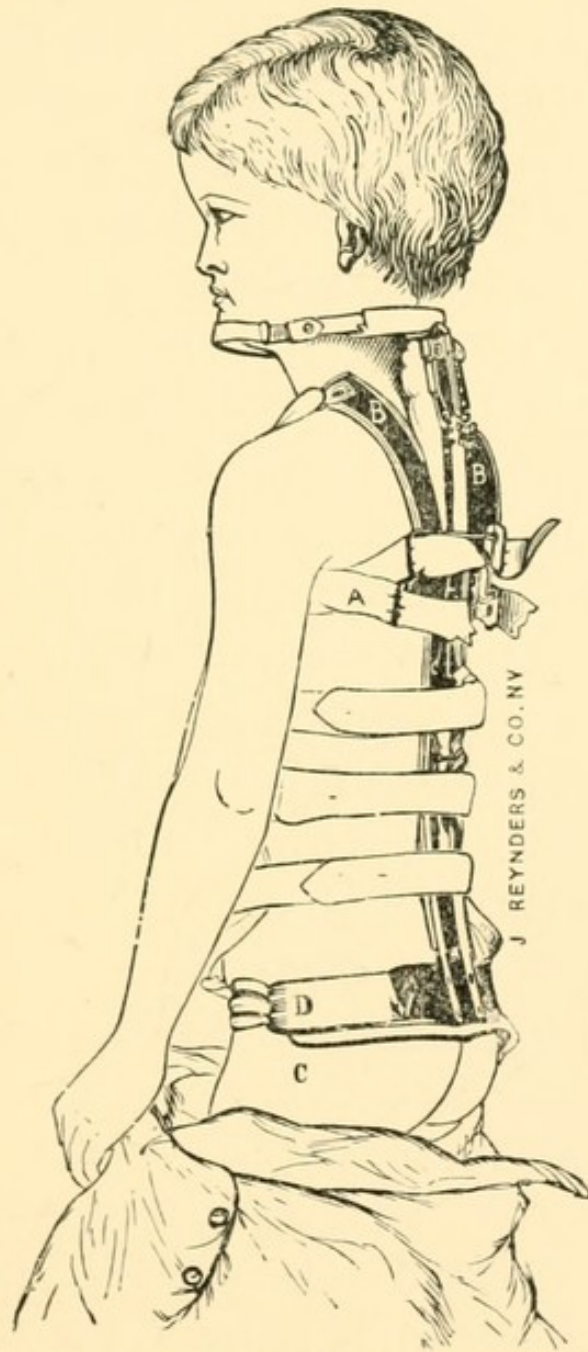


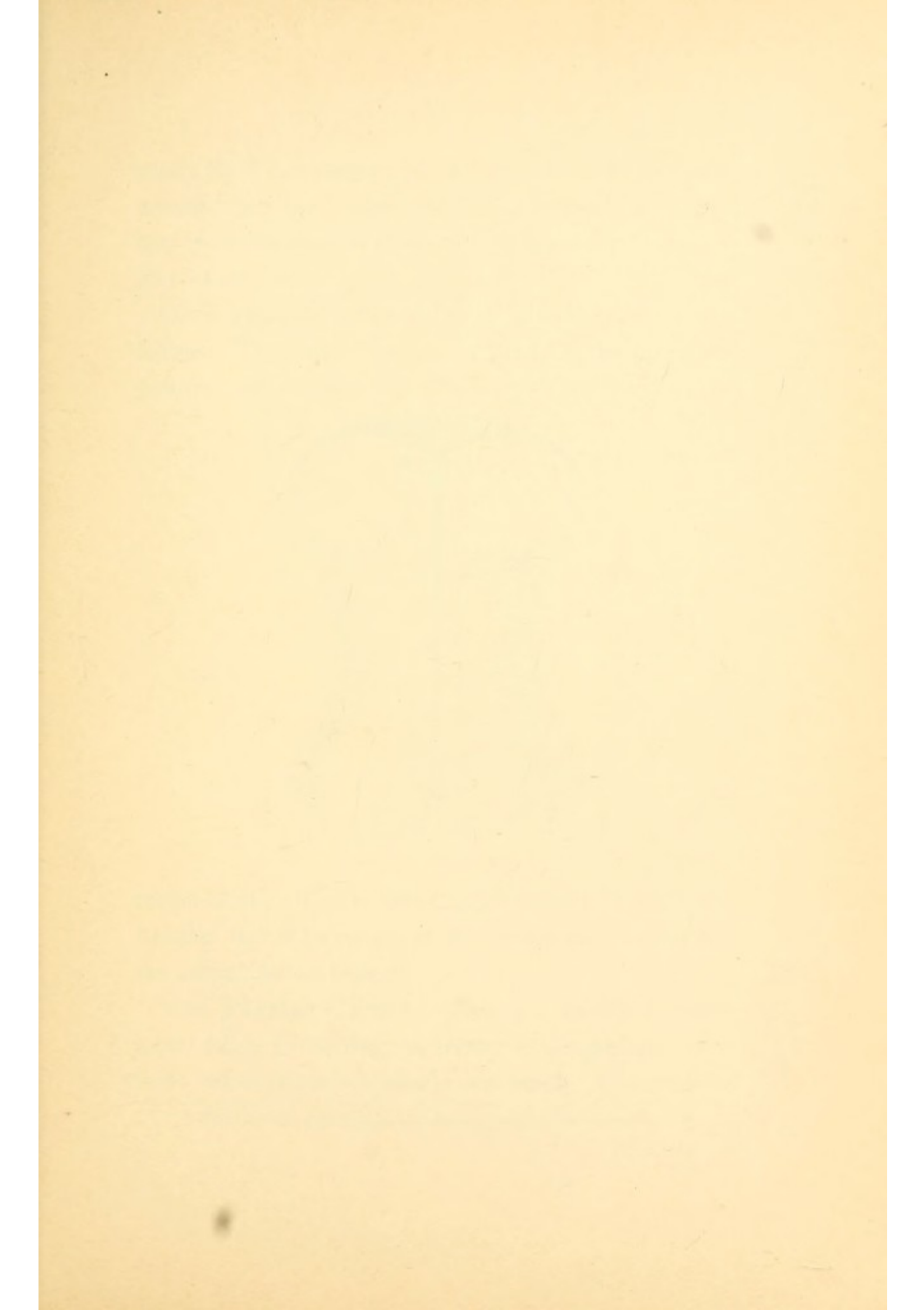
FIG. 12.—Taylor's Spinal Brace with Chin Rest. B B, Shoulder Bands; A, Straps under Axilla; D, Pelvic Band.

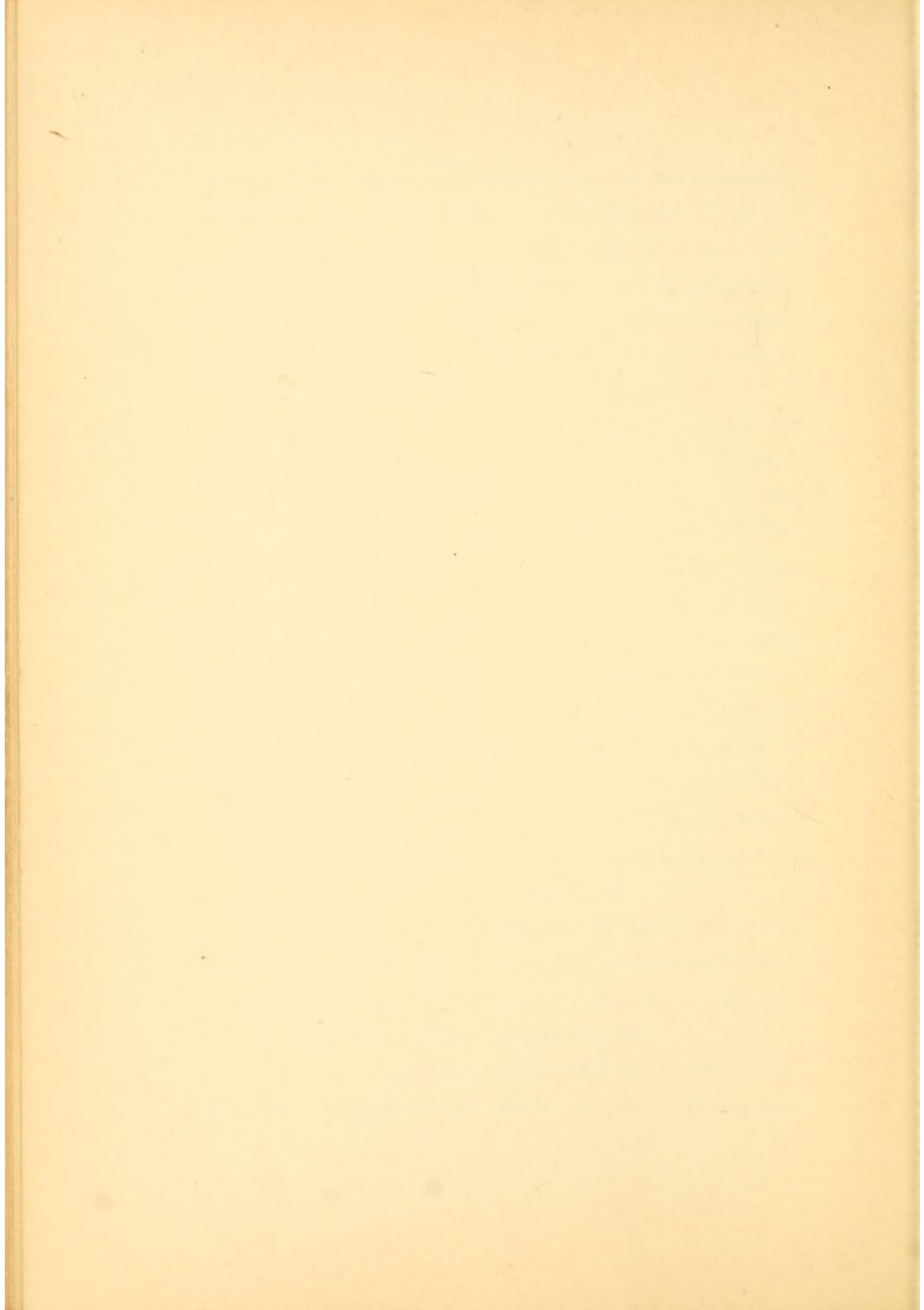
border of the sternum, laterally from the trochanters to the axillæ, and posteriorly from the inter-natal fold to the middle of the scapulæ. It should be as light as is consistent with firmness, averaging from one-eighth to one-quarter of an inch in thickness, being made somewhat stronger where it is subjected to greater strain, namely, at the pelvic portion and at the sternal region.

The plaster of Paris used in the application of the jacket should be of the finest quality of calcined "dental" plaster. If such is used, it will not be necessary to add anything to the water to quicken the "setting." The bandages are prepared by rubbing the plaster into strips of crinoline six inches wide and six yards long. Care should be taken to keep them perfectly dry before using, and they may, if necessary, be baked for half an hour in an oven before being applied. A bandage should be placed on end in a pail of warm water, and as soon as the bubbles of air cease to escape, it is taken out, squeezed gently and applied. A second bandage should be dipped into the water while the first is being applied and so on, until the jacket is completed.

While the plaster is setting, the edges of the jacket should be trimmed and made smooth at the lower border, to allow for flexion of the thighs, and at the upper border, beneath the arms, to prevent chafing.

The patient is kept suspended until the plaster has set. This usually takes about fifteen minutes. He is then





gently lifted and placed upon a mattress, where he should remain until the jacket has become firm. The jacket may be changed at intervals of two months or longer, as may be indicated.

Other methods of applying the plaster jacket are as follows : The jacket may be applied in the horizontal position, the patient lying prone upon a long band of

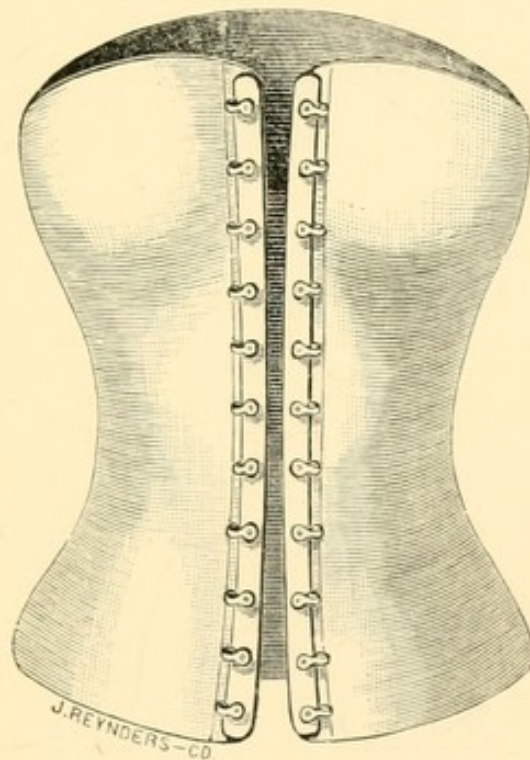


FIG. 13.—The Corset.

cotton cloth. This is called the “Hammock Method.” Another way is by means of the Goldthwait frame with the patient on his back.\*

**The Plaster Corset.**—This is a modified plaster jacket made by cutting the plaster in the median line in front before it has completely hardened. It is removed

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\* What are the advantages and disadvantages of these methods ?



from the body, and having been fixed in proper position by a bandage, it is then baked in an oven. Leather strips with rows of eyelets or hooks are then fastened to the edges, so that it may be laced. The corset is inferior to the ordinary jacket\* and should not be em-

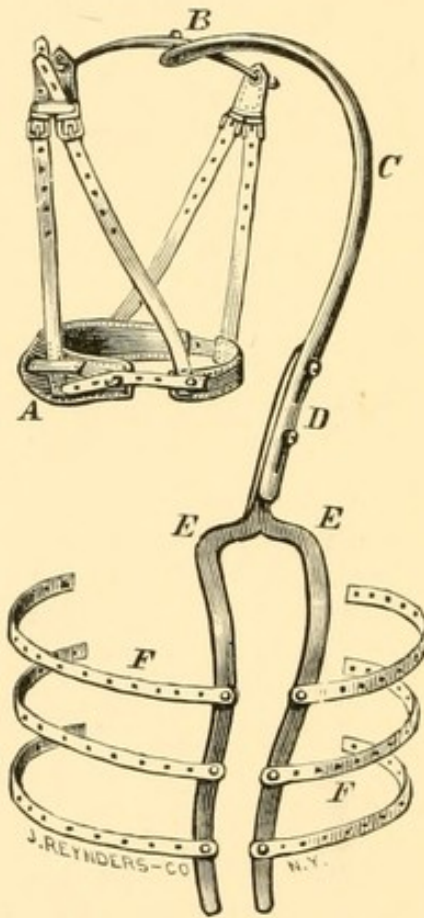
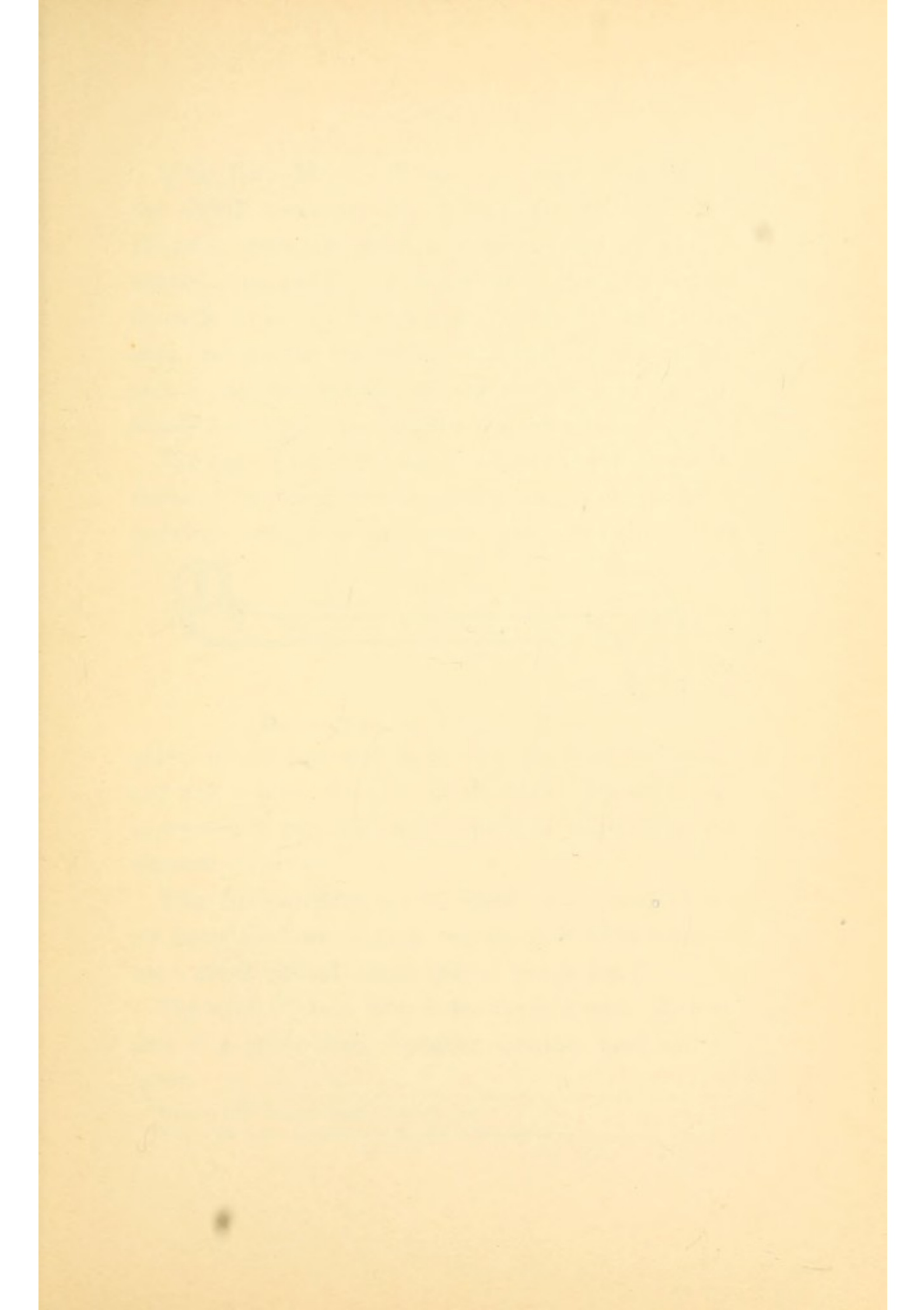


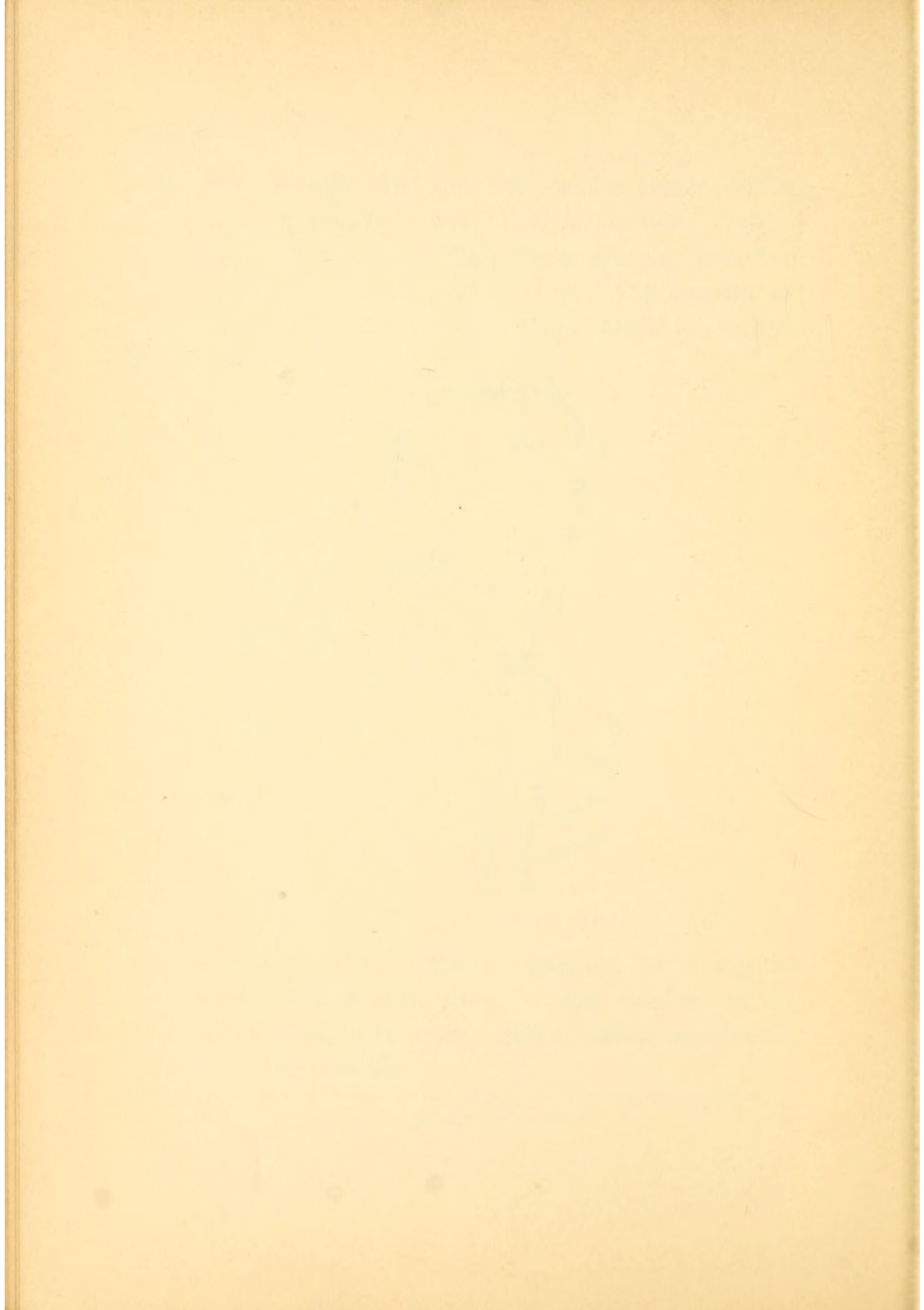
FIG. 14.—Sayre's Jury Mast.

ployed when the jacket is indicated, but it may be used in convalescent cases. Corsets moulded to the shape of the body are also made of leather, paper-mass, and other materials.

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\*Why is this the case?





**The Jury-Mast.**—When the disease is as high as the eighth dorsal vertebra, a head-support is required. In such cases the jacket is supplemented by what is termed a jury-mast.\* This is a bar of steel of sufficient strength, extending from a point below the seat of disease, and curving behind the neck and over the head in such a way, that a halter to support the head may be attached to a cross-bar directly over the ears.

The base of the jury-mast is inclosed in the superficial layers of the plaster bandage. The head is tilted slightly backward, and is in part supported by the halter. The

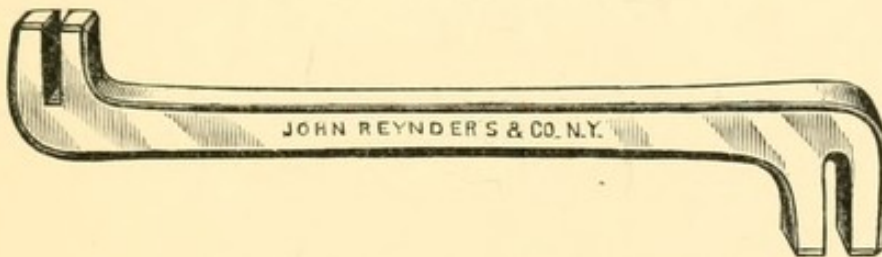


FIG. 15.—Wrench for Shaping of Apparatus.

object of the jury-mast is to draw the head backward, and thus to hold the spine in an extended position and to remove in part the superincumbent weight from the diseased vertebræ.

**The Spinal Brace.**—In disease of the cervical, upper dorsal, or lower lumbar regions, it is often better to use a **steel spinal brace** instead of a jacket.†

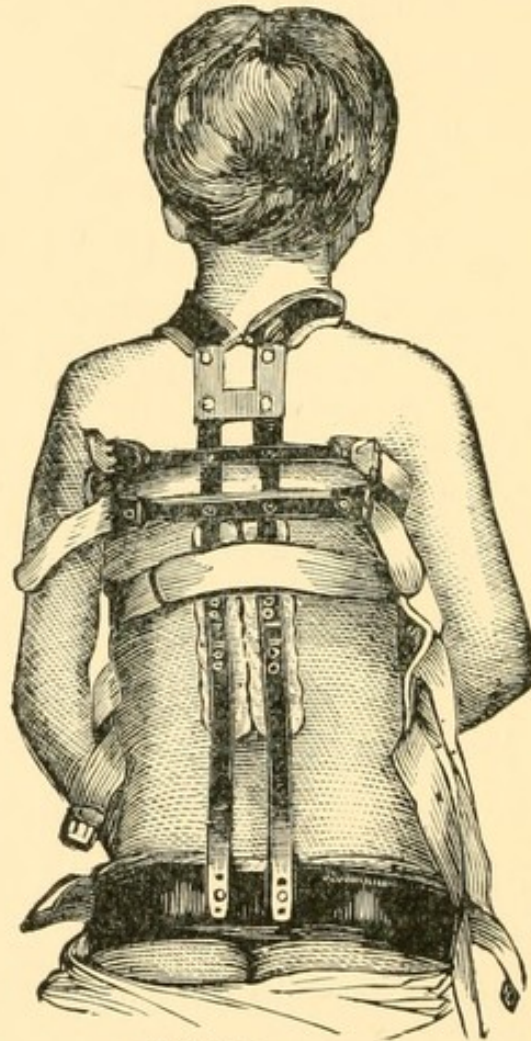
The most efficient form is the Taylor brace. It consists of a pelvic band, uprights, shoulder bars, and an apron.

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\*What are the disadvantages of a jury-mast?

†Why is the brace preferable in disease at these points?

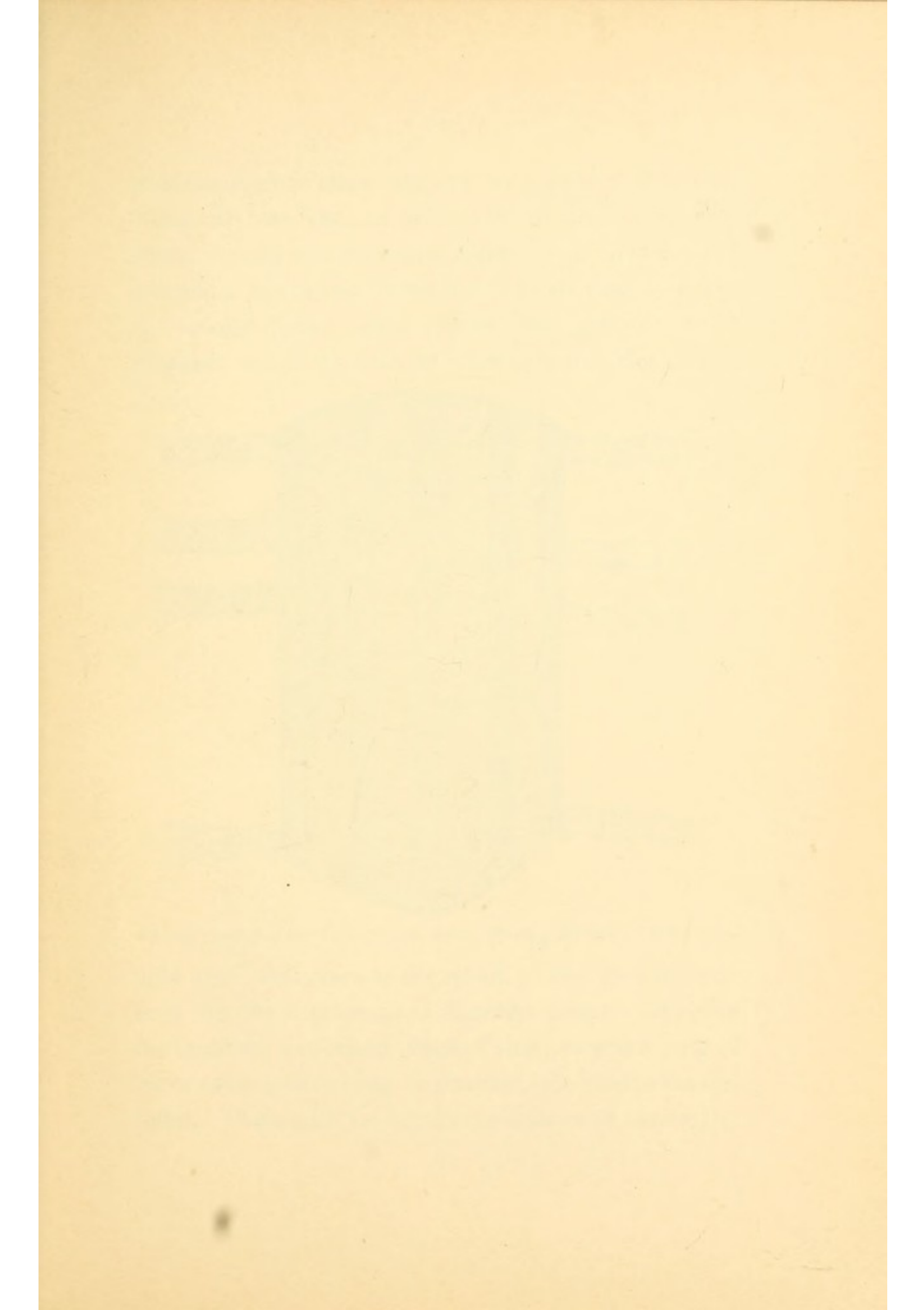
The pelvic band is made of sheet steel, gauge about 18, one and a half to two inches wide, and long enough to encircle half of the pelvis, reaching nearly to the anterior border on either side. To this band the two

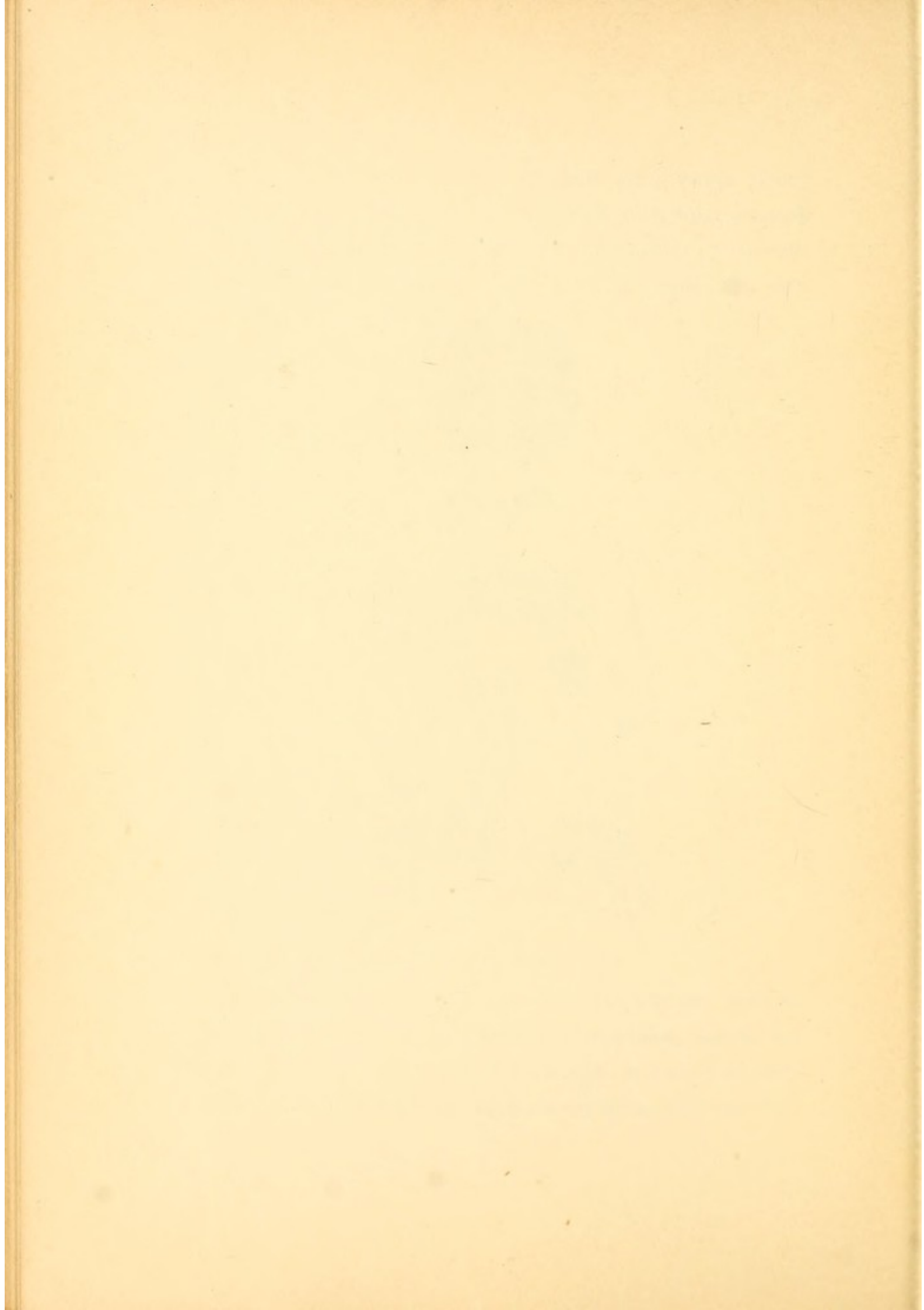


J. REYNOLDS—CO

FIG. 16.—Taylor's Spinal Brace.

uprights are attached; these are about half an inch in width and of about 12 gauge, or somewhat heavier for older patients. The material is what is known as mild steel, strong enough to support the spine, and yet mal-





leable enough to allow shaping by means of wrenches. These two bars pass on either side of the spinous processes, directly over the lateral masses, or at an interval of one and a half to two inches from one another, to about the second dorsal spine, where they are continued on either side of the neck by adjustable shoulder bars of

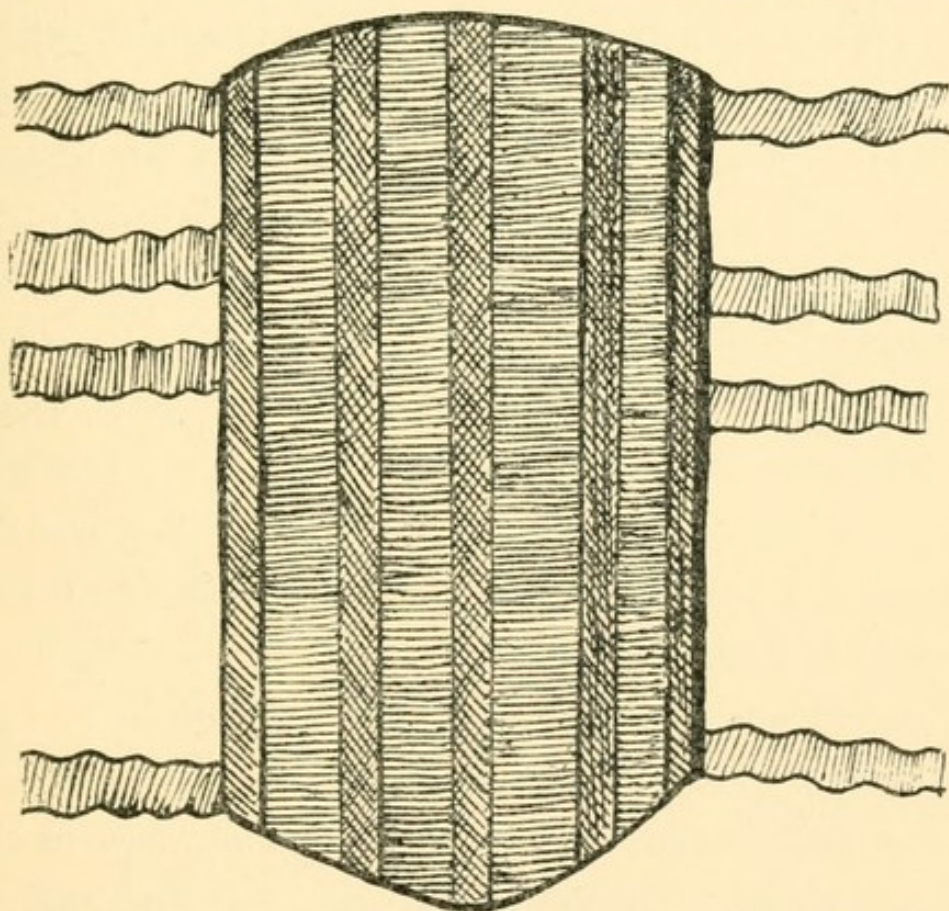


FIG. 17.—Apron of the Taylor Spinal Brace, Showing Whalebone and Straps.

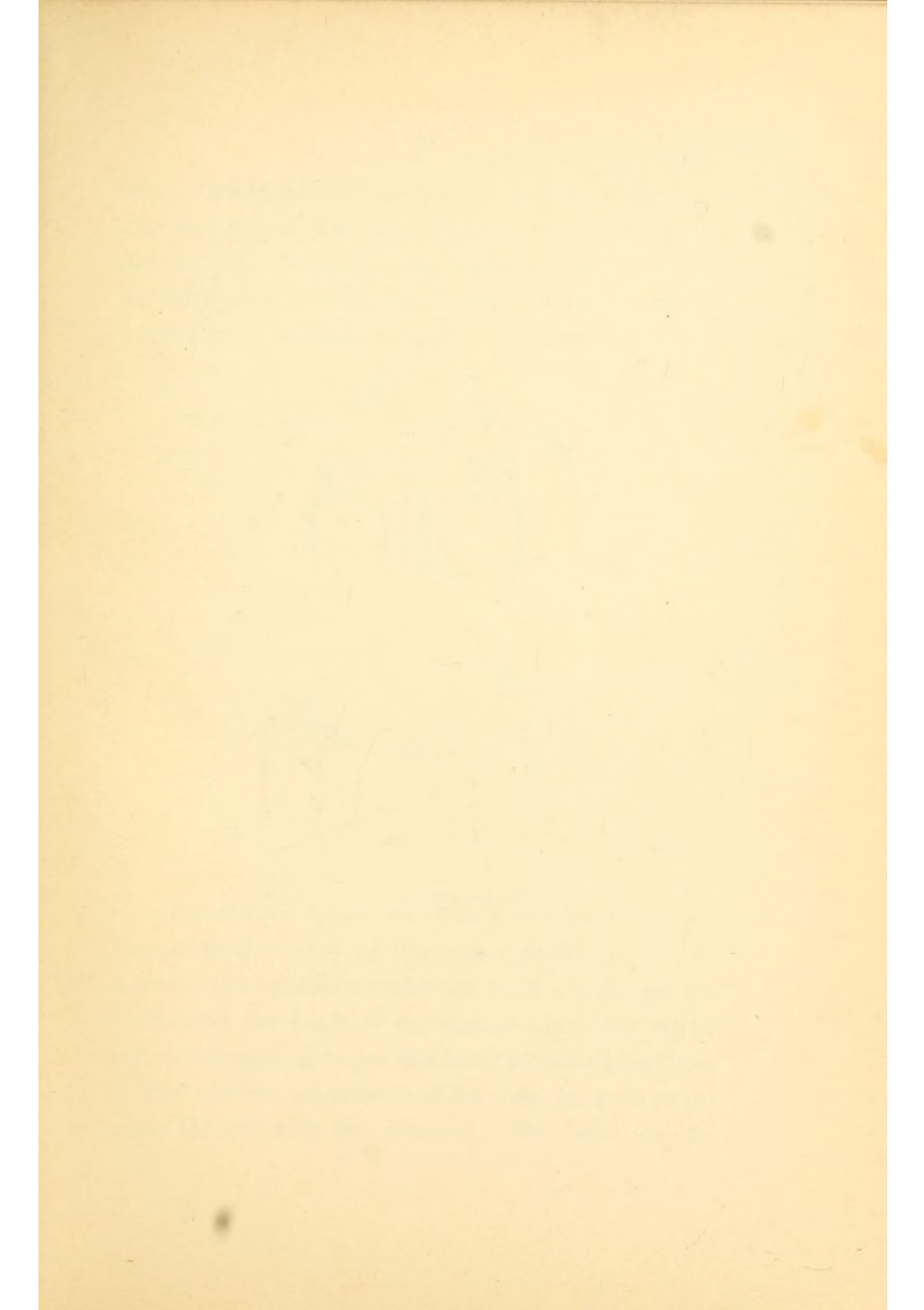
light steel, that reach to the centre of the clavicles, and serve for the attachment of shoulder straps. Opposite the kyphosis, perforated plates of steel, to which pads of felt or other material may be attached, are fixed to the uprights. These pads serve to fix the spine more accurately,



and serve as a lever over which the spine may be bent slightly backward. The back bars are fitted closely to the back, being shaped on a tracing made with a strip of lead. The pelvic band is padded and covered with leather, its lower border should overlap the beginning of the inter-natal fold, its lateral extremities lying just above the trochanters. The apron, by means of which the brace is attached to the back, should be made preferably of strong canvas, strengthened with whalebone. It should be long enough to cover and to support the abdomen, and to reach well up on the chest. It is attached by means of straps and buckles as illustrated in the diagram. The brace is adjusted to the patient, and the straps are drawn sufficiently tight to hold it firmly in place. As much pressure is exerted as the skin over the kyphosis will bear, to fix the spine and to exert sufficient leverage to straighten it slightly. The shape of the bars, is changed when necessary by means of wrenches.

The brace is to be worn constantly. It is to be removed and readjusted only when the child lies in the prone position. Practically speaking, the back may be regarded as broken, and the appliance as a splint which holds it in proper position until union is firm.

When the disease is above the eighth dorsal vertebra, a head support is usually required. The Taylor support, a steel ring provided with a lateral hinge and a rubber chin rest, is supported behind upon a pivot, the chin





being slightly elevated, so that the weight of the head may be, as far as possible, removed from the seat of the disease. In disease of this region of the spine, the shoulders usually fall forward and downward, and the upper part of the chest recedes. This tendency may be

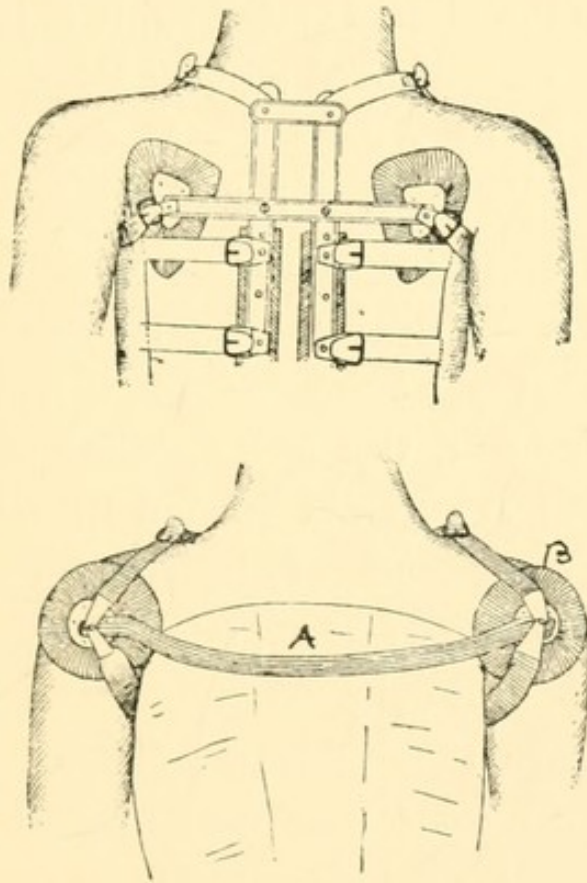


FIG. 17.—Whitman's Shoulder Brace.  
*A*, Steel cross bar. *B*, Saucer shaped pads of metal or hard rubber.

checked by the use of the Whitman shoulder brace. By means of this appliance backward traction is exerted directly upon the heads of the humeri—thus the upper part of the spine is more effectively splintered, and the forward reaching movements of the arms that tend to increase the deformity are restrained. The brace may be

used with the jacket as well as with the Taylor appliance.\*

If the disease is in the upper cervical region, more perfect fixation may be required by means of attachments to fix the occiput and to prevent all motion of the neck. In this class of cases fixation of the head may require rest in the horizontal position.†

**Treatment of Abscess.**—Abscess is the most dangerous complication of Pott's disease, although in cases that have been under efficient treatment it is not often a cause of anxiety.

The treatment may be—

*First.*—Expectant, that is, the abscess is considered as a symptom that does not demand special treatment, unless it becomes a source of discomfort or danger. In many instances perfect absorption and cure is finally accomplished by natural processes.

*Second.*—Aspiration. Cure is often hastened by removing the fluid contents of the abscess from time to time, or at least it is restrained within its original limits.

*Third.*—Aspiration and injection. The injection of iodoform emulsion after aspiration is theoretically indicated, but practically it is of little value.

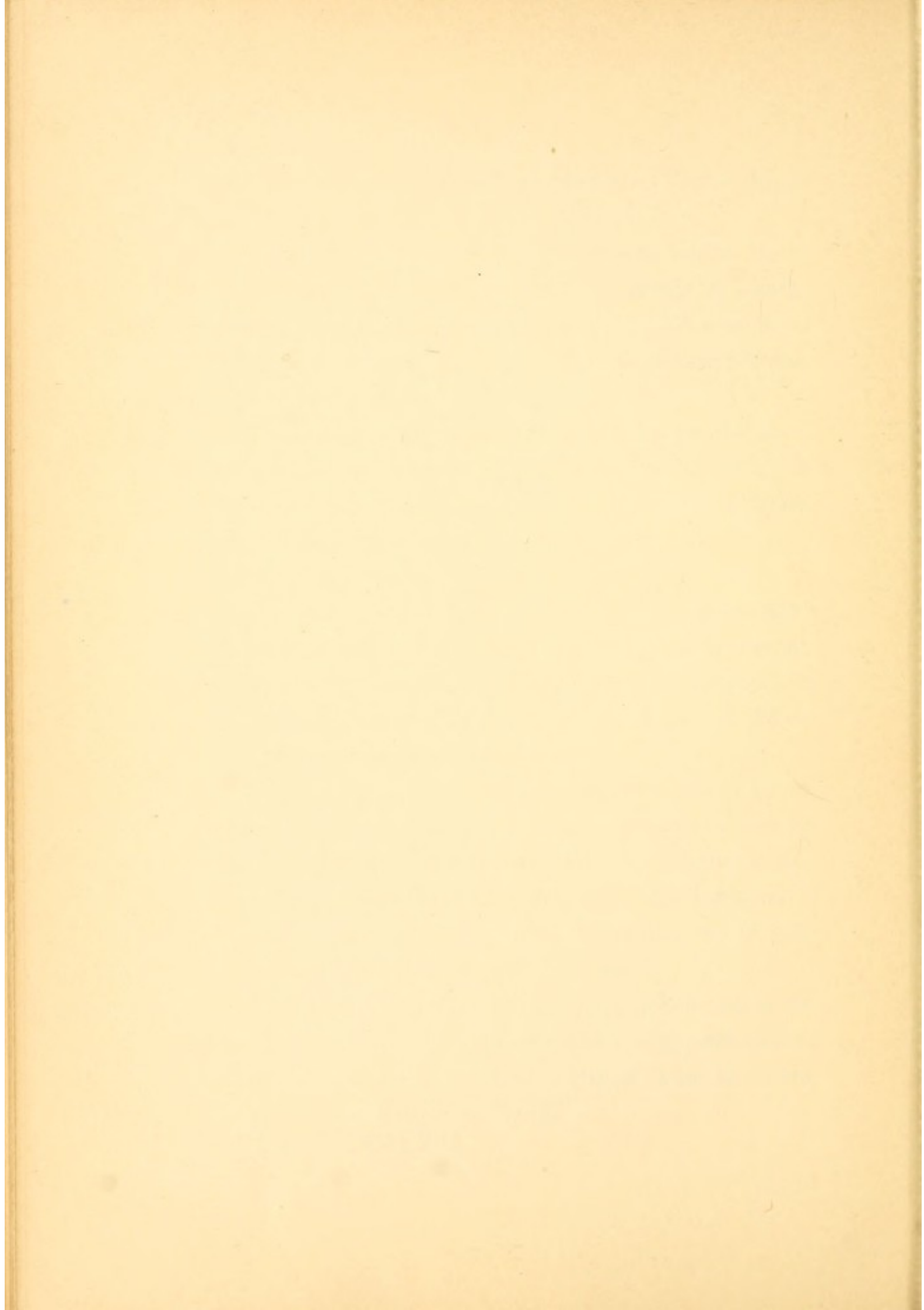
*Fourth.*—If the abscess is enlarging, or if it causes discomfort, its contents may be removed by a free incision and thorough washing, after which it may be closed by suture.

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\* Whitman. *Medical News*, Nov. 19, 1892.

† What is a Thomas Collar?





If the abscess has become infected, as indicated by the constitutional symptoms, free incisions and efficient drainage are indicated.

The psoas and iliac abscesses should be opened both in the loin and in the thigh. If possible, the latter opening should be made to the outer side of the femoral vessels.

The behavior of an abscess, of course, depends upon the character of the underlying disease. As long as the disease is active, tuberculous pus is likely to form; thus sinuses may persist for an indefinite time after spontaneous or operative evacuation.

In certain instances it may be possible to remove the focus of disease, but this is, of course, impracticable in the majority of cases. The great danger of the tuberculous abscess is infection with pyogenic germs, and this danger must always be borne in mind when operative treatment is recommended.\*

Retro-pharyngeal abscess requires prompt evacuation. The incision should be made by preference behind the sterno-mastoid muscle, in order to provide an external opening for the fluid.

Abscess in the posterior mediastinum that interferes with respiration may be evacuated by the operation of costo-transversectomy.†

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\* What are the symptoms that would indicate such infection?

† Whitman, *Pediatrics*, Vol. vii, Nov. 5, 1899.



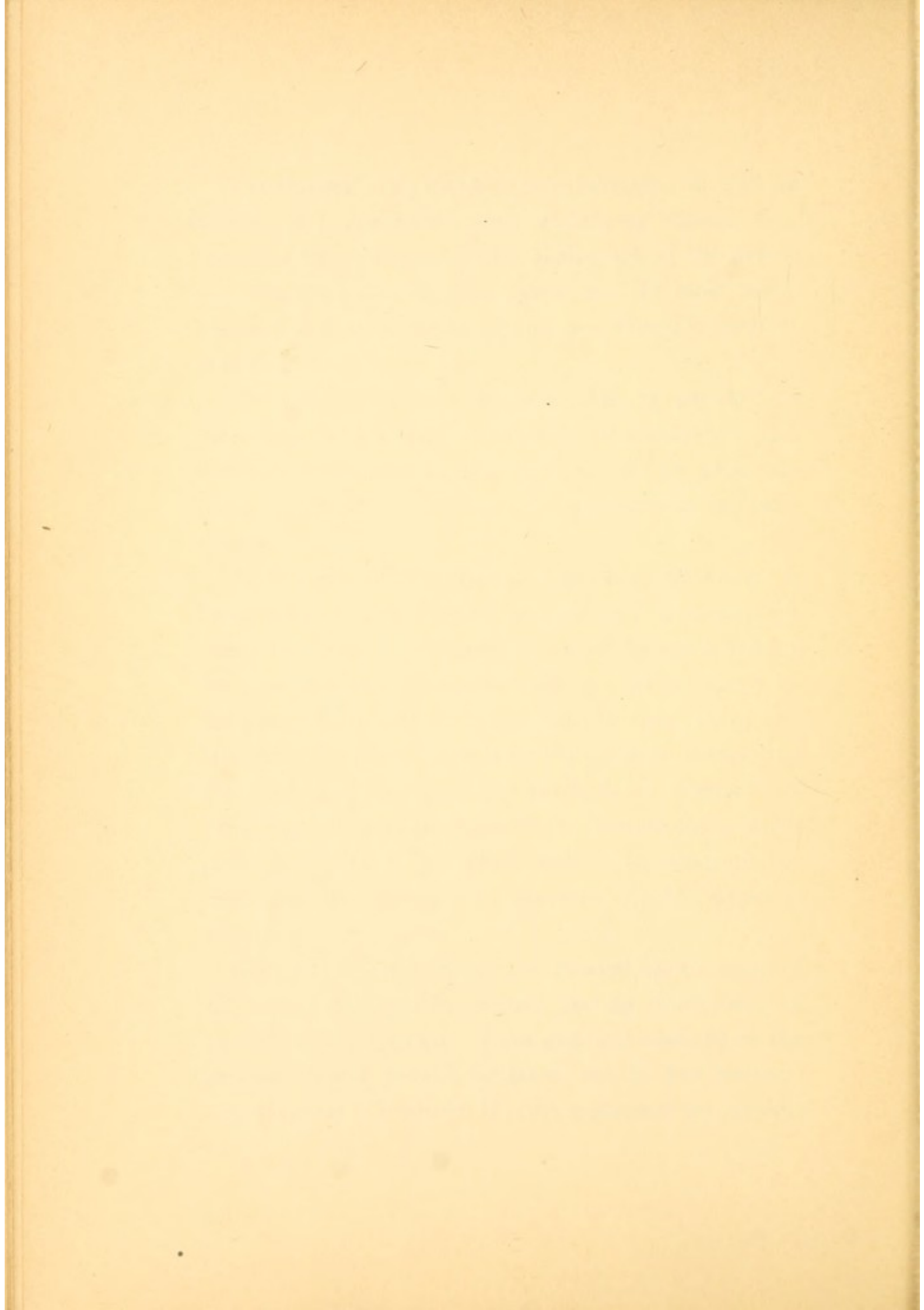
**Treatment of Paralysis.**—Paralysis, as well as abscess, is a symptom of an underlying disease that may best be treated by a rigid application of the principles that have already been described. In most cases, rest on the fixation frame in the over-extended position is indicated.

The prognosis is favorable in at least 75 per cent. of cases efficiently treated. Cure may be confidently predicted in from three to nine months. As the great majority of patients are children, the treatment is easy and simple.

**Operative Treatment.**—Operative treatment is rarely indicated, except as a last resort. If abscess be present at the seat of disease, it should be evacuated by the operation of costo-transversectomy, as suggested by Ménard. Laminectomy, that is, the removal of the laminæ at the seat of disease for the purpose of exposing the cord, and removing the products of disease that press upon it, may be indicated in certain cases, especially in adults. The death rate is, however, 30 per cent., and the prospect of final cure by this means is uncertain.

**General Measures.**—The general health requires attention. The patient should pass as much time as possible in the open air. Even children confined on the Bradford frame should be taken out in fine weather. Absolute rest is required, if acute symptoms are present;





but exercise in moderation is advisable, when the disease is quiescent.

The food should be simple, but nutritious,—milk, butter and eggs being especially indicated. Digestive disturbances should receive careful attention. General tonics, as, for example, cod liver oil, hypophosphites, strychnia, and iron may be employed when necessary.

### III. TUBERCULOUS AFFECTIONS. (Continued.)

Tuberculous Disease of the Joints. The Hip. The Knee. The Ankle. The Shoulder. The Wrist. The Elbow. The Sacro-iliac Joint.

#### I. DISEASE OF THE HIP JOINT.

SYNONYMS.—*Morbus coxæ* or *coxarum*; tuberculous arthritis of the hip.

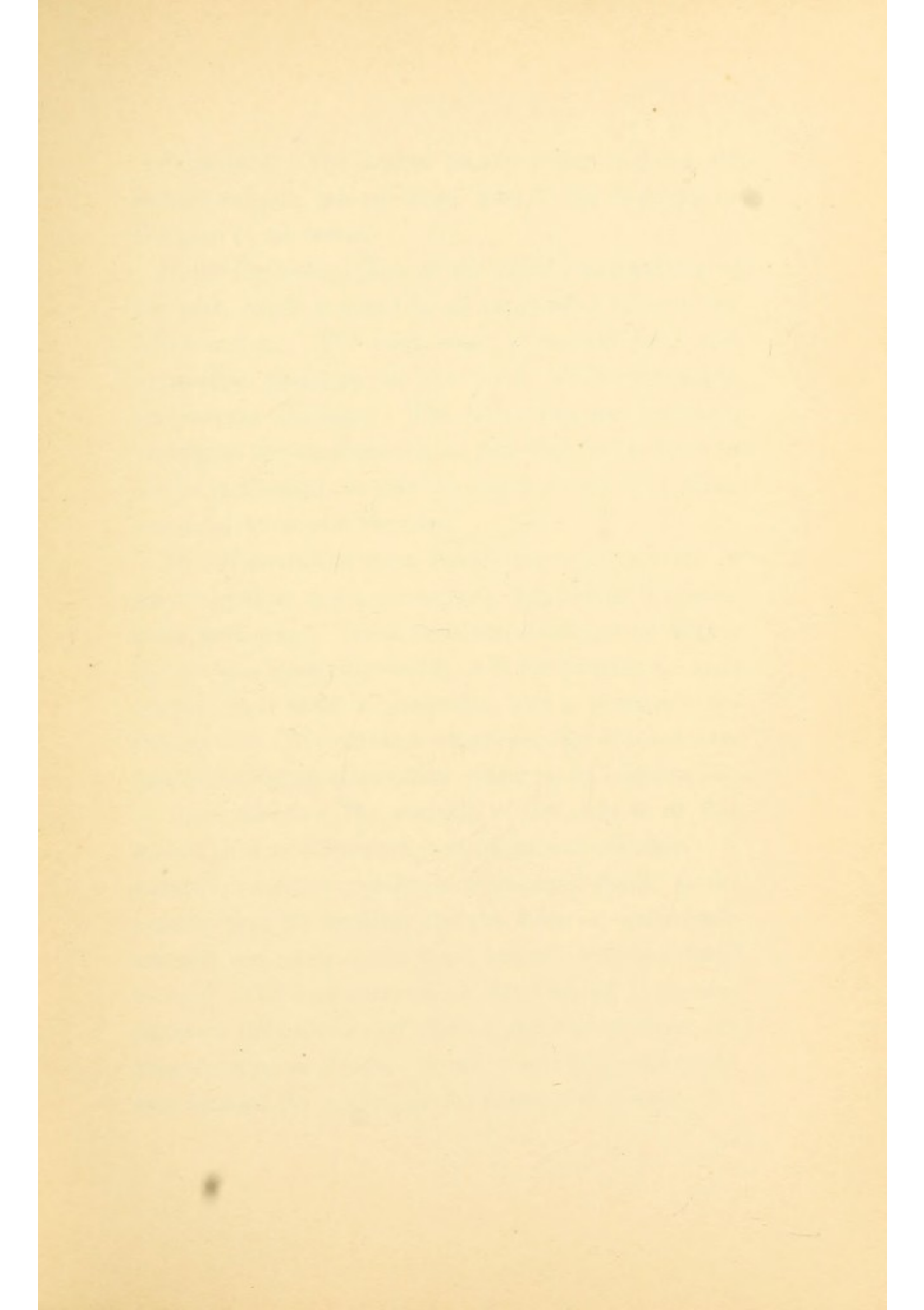
DEFINITION.—A chronic tuberculous disease of the hip joint, which usually begins in the head of the femur, but occasionally takes its origin in the acetabulum or in the synovial membrane of the joint.\*

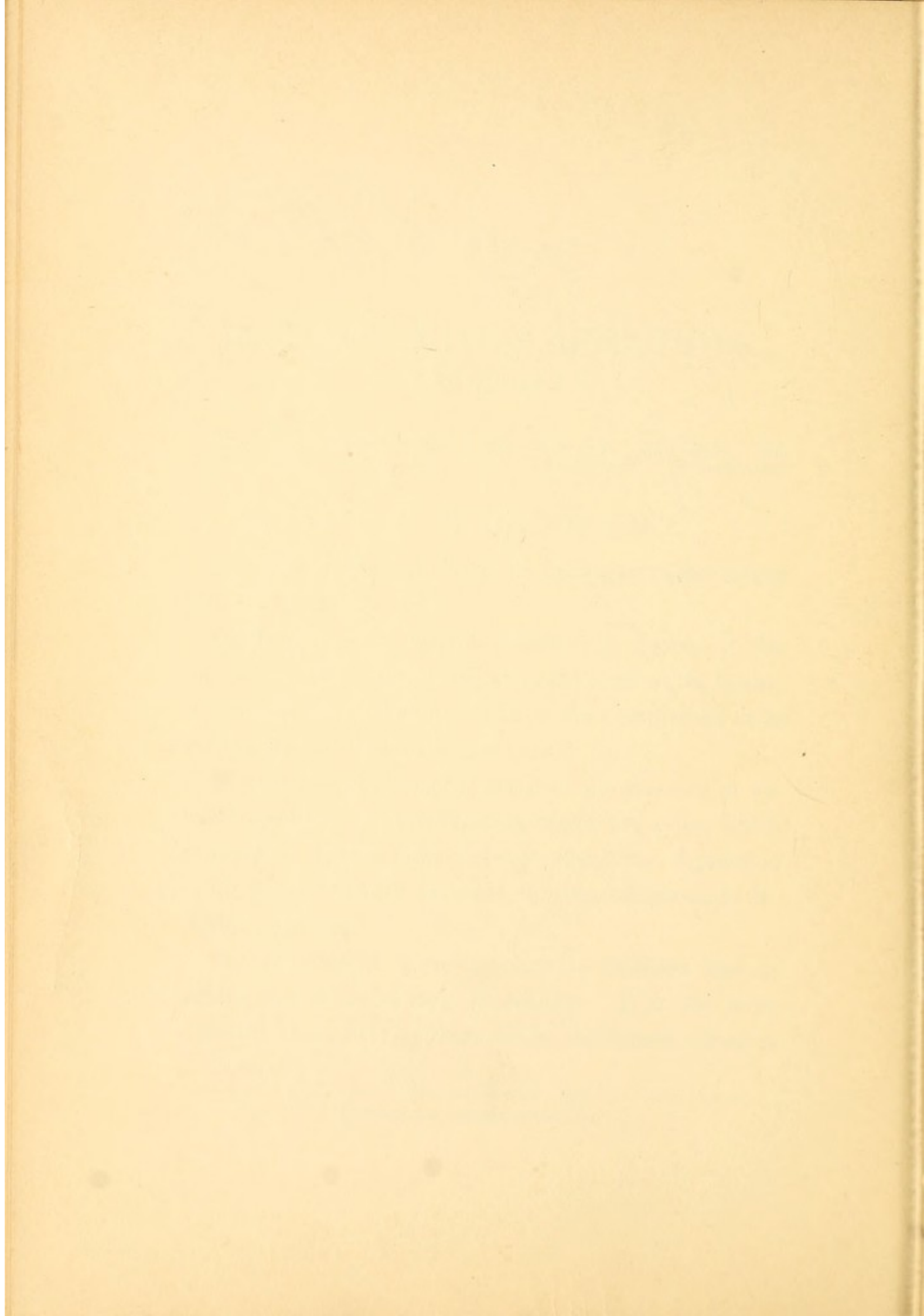
ETIOLOGY.—The essential cause is the presence of tubercle bacilli. The predisposing causes are, injury which produces a “*locus minoris resistentiæ*,” and depression of the general vitality, induced, in some instances, by infectious diseases.

The affection is more common in children than in adults, and in males than in females. It is the most common and most important of the tuberculous diseases of joints.

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\* Study the anatomy of the joint.





**PATHOLOGY.**—The disease usually begins in the newly formed bone on one or other side of the epiphysis of the head of the femur.

In the beginning, there is the usual **congestion** of the part, which is found in all varieties of tuberculous inflammation. The next stage is marked by a **destructive process** in the bone, which eventually reaches the cartilage. The latter becomes softened, undergoes fibrous degeneration, and may break down in one or more spots, so that the diseased bone is in direct communication with the joint.

The synovial membrane usually participates early in the congestion, and a sympathetic **synovitis** is present at an early stage. When the tuberculous process reaches the synovial tissue, it proceeds as in the primary synovial disease; thus there is congestion and a productive inflammation; the thickened membranes are covered with pale granulations, then follow caseation and destruction of these tissues. The contents of the joint is at first serous, then sero-fibrinous, and finally sero-purulent. It consists of exudate and debris of destroyed tissue. In the synovial type the cartilage and the bone are secondarily affected, but rarely to the same extent as in the bony variety. The fluid contents of the diseased joint may perforate the capsule and distend the tissues about the joint, forming an abscess. Infection with pyogenic germs may increase the activity of the destructive disease.



**SYMPTOMS.**—Hip disease is a chronic destructive process affecting a very important joint. In the early stages the disease is confined to the interior of the bone. At a later stage the joint surfaces are usually eroded. These facts must be remembered when the causal relations of the symptoms are considered. The early stages are characterized simply by sensitiveness, while in the later stage the joint may be practically destroyed.

**Pain.**—Pain is not usually a prominent symptom and patients often assert that they suffer no pain whatever.\* In most instances, however, there are times during the course of the disease when the joint is very sensitive. Pain is usually referred to the knee, and is induced by missteps or falls.†

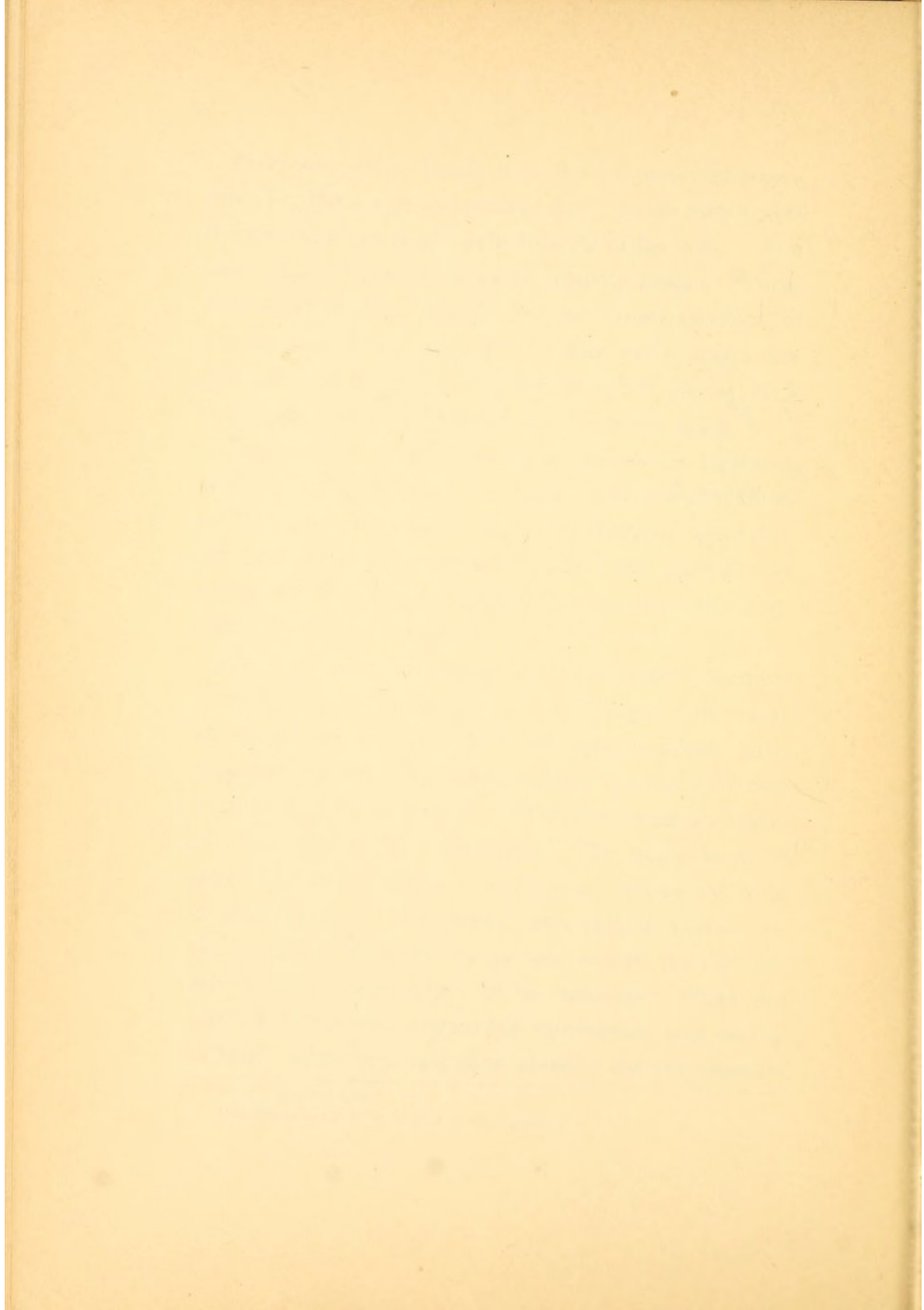
As the disease progresses, the pain usually becomes more severe, and what are termed “night cries” may attract attention. The child will start suddenly in its sleep and cry out, sometimes without waking, or it may be awakened by its own cry. This may occur a number of times during the same night. The explanation of night cries in hip disease is as follows: When the child is awake the joint is protected from sudden motion by the voluntary efforts of the patient and by the involuntary or reflex contraction of the muscles. When this control is lessened, unguarded movements may set up sudden contraction, and thus pressure on the sensitive

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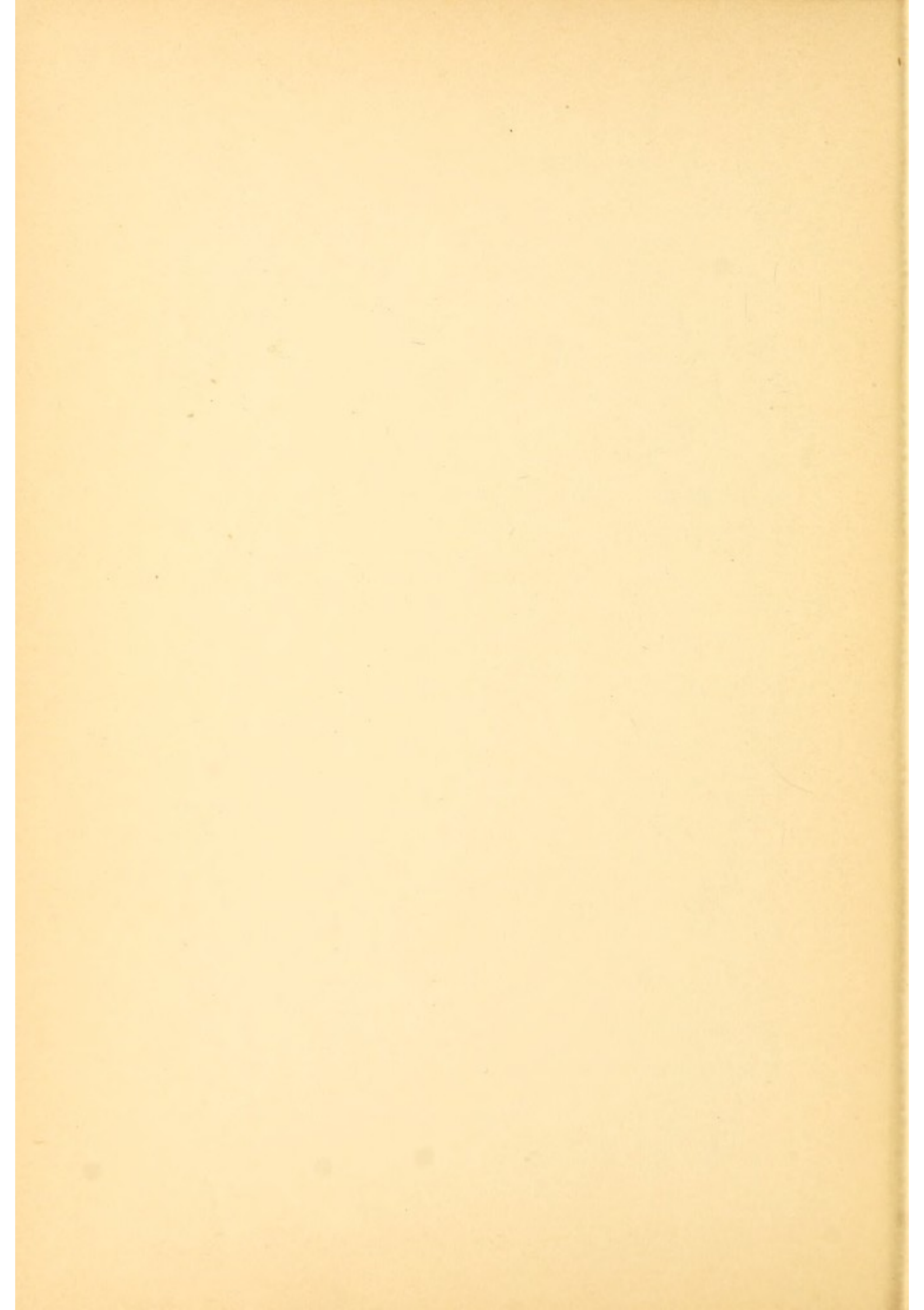
\* Why is this the case ?

When may there be local pain in hip disease ?

1. Pain.
2. Limp.







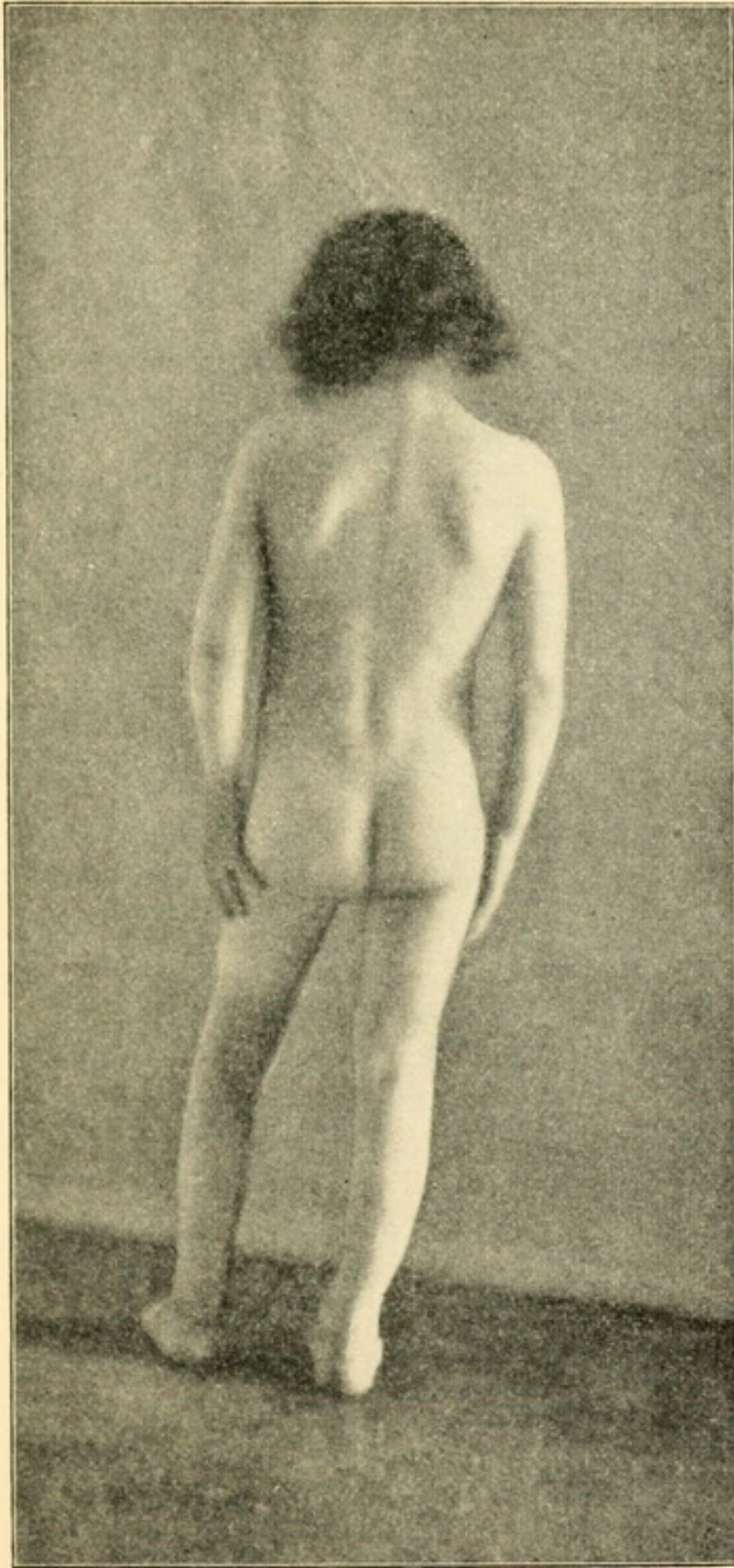


FIG. 18.—Hip Disease. Flexion, Abduction and Lateral Curvature of the Spine. (R. H. Sayre.)

parts. These cries indicate that the disease is of a somewhat acute or progressive type.

Direct pressure on the joint may cause discomfort, and, if the disease be acute, there may be local hyperæsthesia of the skin. This is usually, however, symptomatic of septic infection.

**Limp.**—Limp is by far the most important and distinctive symptom of hip disease. The patient walks bearing the weight on the front of the foot, with the hip and knee joints slightly flexed.

The limp is partly voluntary, and partly involuntary, even in the earliest stage of the disease.\* The patient avoids attitudes and motions that subject the sensitive parts to strain, while freedom of motion is directly limited by the protecting reflex spasm.† At a later stage the limb may be distorted, and the joint may be ankylosed, when, of course, the limp is due to other causes.

**Stiffness**—Stiffness is primarily caused by reflex muscular spasm, a spasm that affects all the muscles about the joint, and thus limits every motion of the part. Motion causes pain in proportion to the sensitiveness of the joint, thus the degree of reflex spasm is in proportion to the activity of the disease, and varies from day to day.‡ Muscular spasm may limit motion absolutely, or it may restrict only the extreme range, but it is always present,

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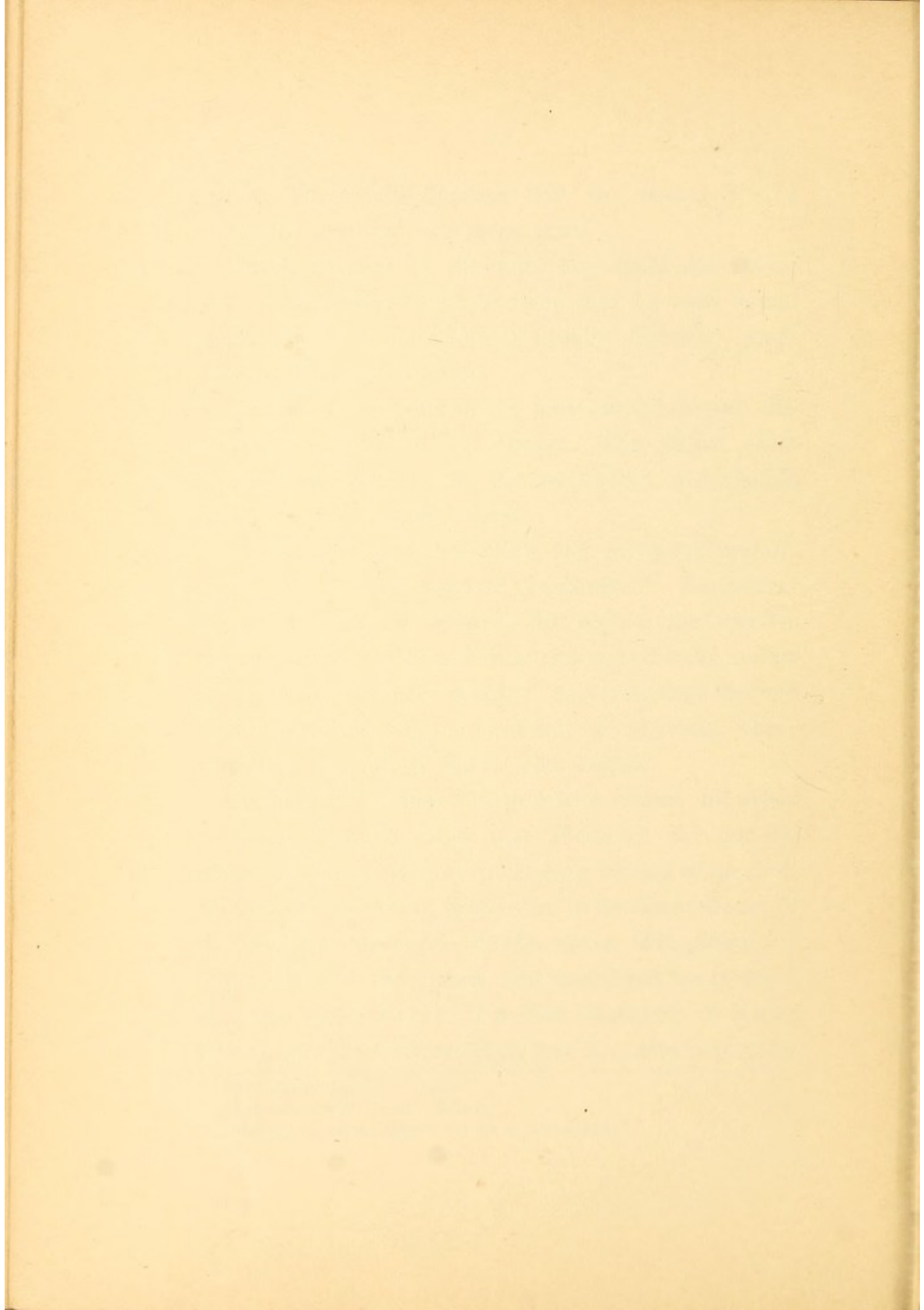
\* What are the causes of a limp?

† How does a limp "favor" the joint?

‡ What is the normal range of motion at the hip joint?







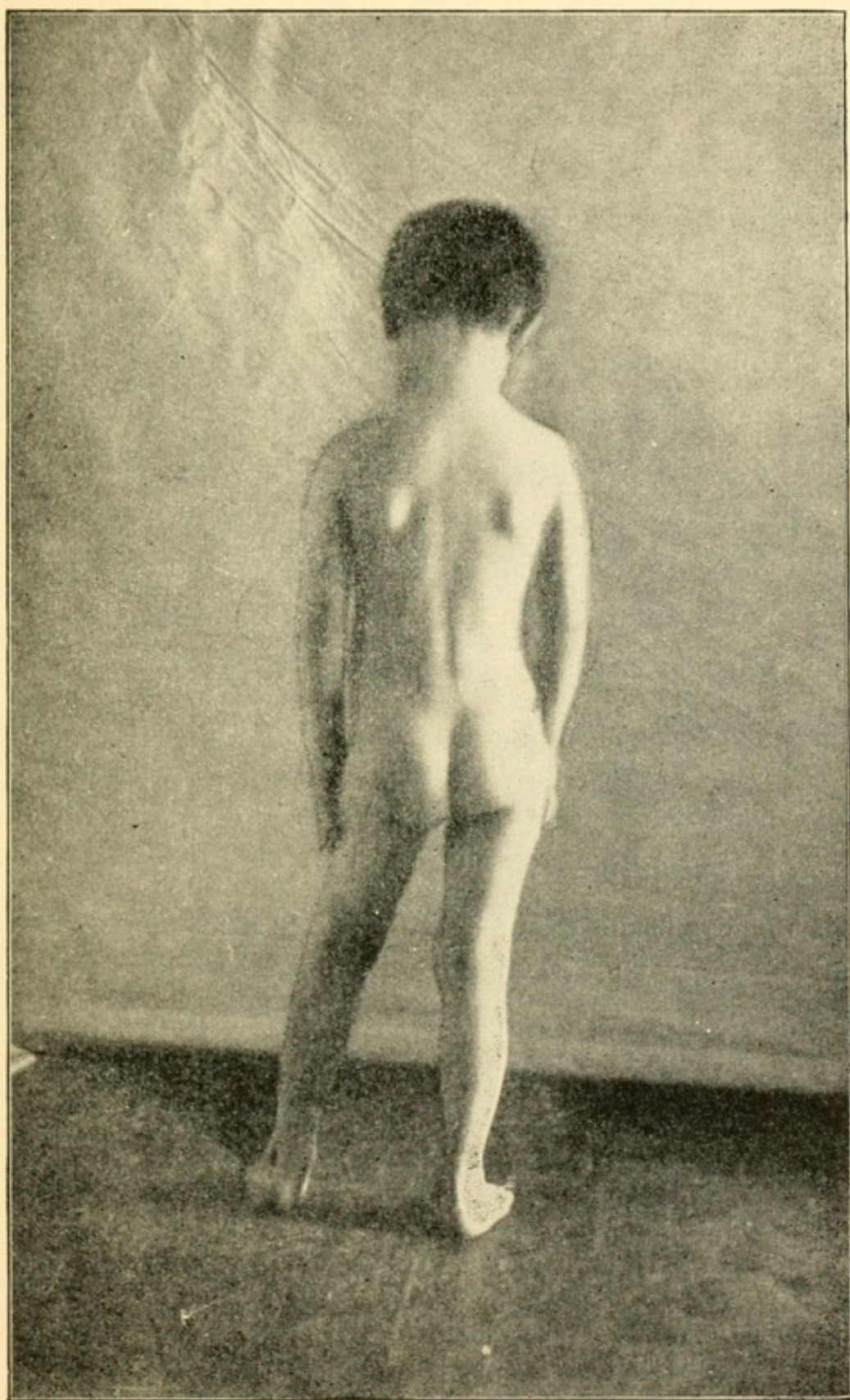


FIG. 19.—Hip Disease. Abduction and Flexion. (R. H. Sayre.)

and it is, therefore, the most valuable of the diagnostic signs.

**Weakness.**—This is in part due to the direct effect of the disease, but principally to the indirect effect of pain and the apprehension of pain.

**Distortion.**—In the early stage of the disease the distortion is caused by muscular spasm, but this is confirmed and increased by the pathological changes in the joint and by the retraction of the muscles and fasciæ. In the early stage the leg is usually flexed, abducted and rotated outward. This is the attitude of rest and the most favorable position for a weakened and partially disabled limb. This is called the “stage of apparent lengthening.”\* In the later stages the attitude usually changes to increased flexion and to adduction and inward rotation,—the adaptive attitude of a disabled limb in which it is subjected to the least possible strain and injury, and the attitude induced by the destructive effect of the disease.† Flexion is the primary and universal deformity in every sensitive joint. It is evidently an indication that the part has become unfitted for the more difficult attitude of complete extension peculiar to man.

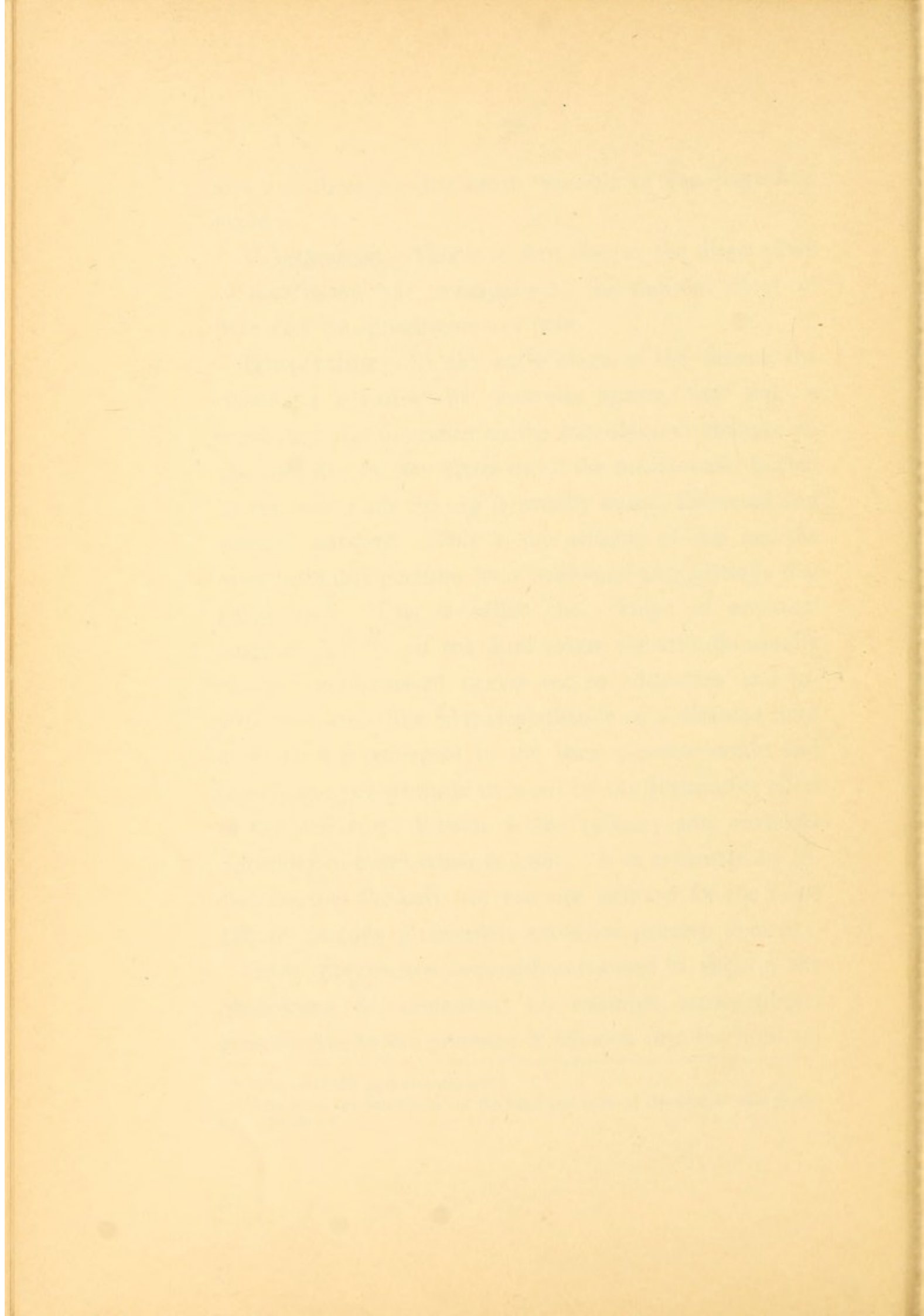
Other theories are frequently advanced to explain the phenomena of distortion; for example, intra-articular pressure due to the presence of effusion into the joint, or

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\* Why does the limb seem longer?

† Why does the destruction of the head and neck of the femur cause flexion and adduction?





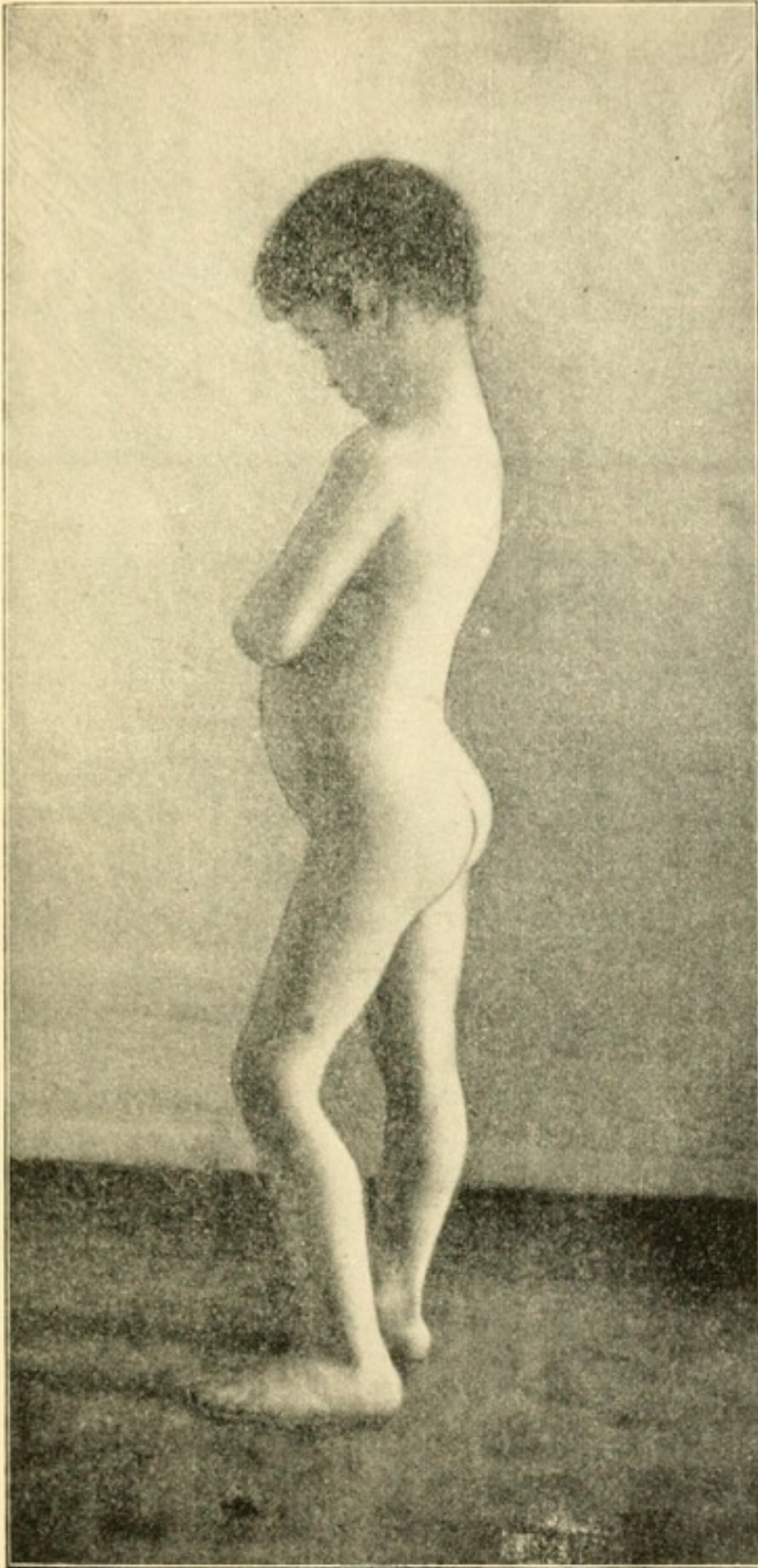


FIG. 20.—Hip Disease. Flexion and Abduction Marked. (R. H. Sayre.)

inequality in the power of the various muscles; but there is little reliable evidence to support these hypotheses.


**Atrophy.**—Atrophy is an indication of diminished use of the limb as compared with its fellow. It is, therefore, a valuable confirmatory sign of disease. This atrophy first affects the muscles, but finally all the tissues of the limb, including the bones, may become involved. Thus it is one of the causes of actual shortening.

**Local heat and local swelling** are not often present in the early stages of the disease.

**Crepitus** is also a late symptom, and is practically of no value.

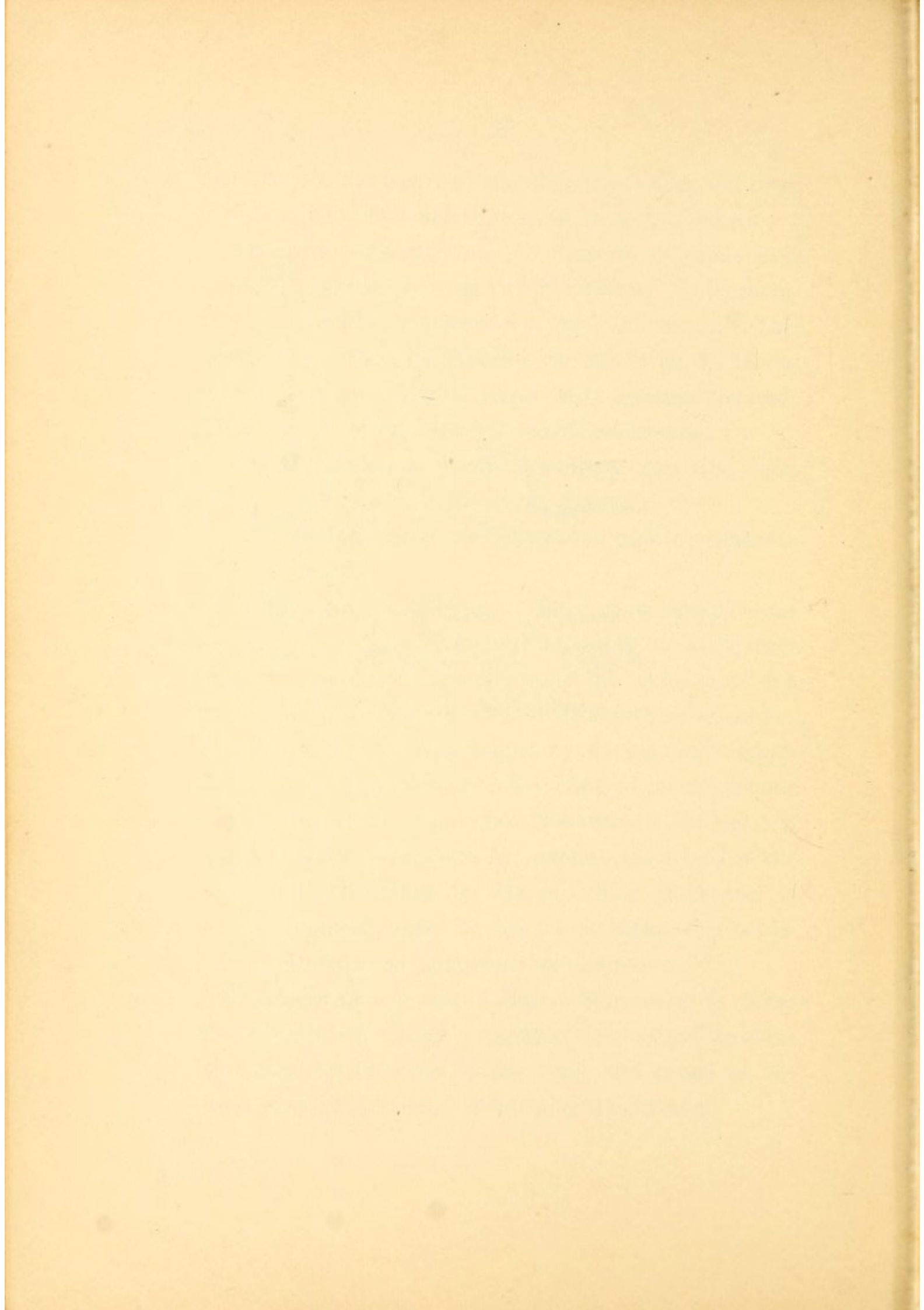
**Changes in Contour.**—These are in some degree the result of atrophy or of effusion, but in the early stage most of them depend directly upon the attitude of the limb. Thus the inguinal fold is decreased by extension and abduction, and exaggerated by flexion and adduction. The fold of the buttock is lowered by abduction, and diminished by flexion and vice versa. The buttock is made more prominent by extreme extension of the limb, and is flattened by flexion. The trochanter is more prominent when the limb is adducted. It is elevated and made less prominent by abduction.

**Shortening of the Limb.**—Shortening is often divided into two classes: Apparent or practical shortening caused by distortion of the limb, and actual or intrinsic shortening caused directly by the disease.

 glenoid fold lowered in  
apparent enlargement

Fold anteriorly more prominent deep and  
chased in adduction and flattened out  
in abduction.





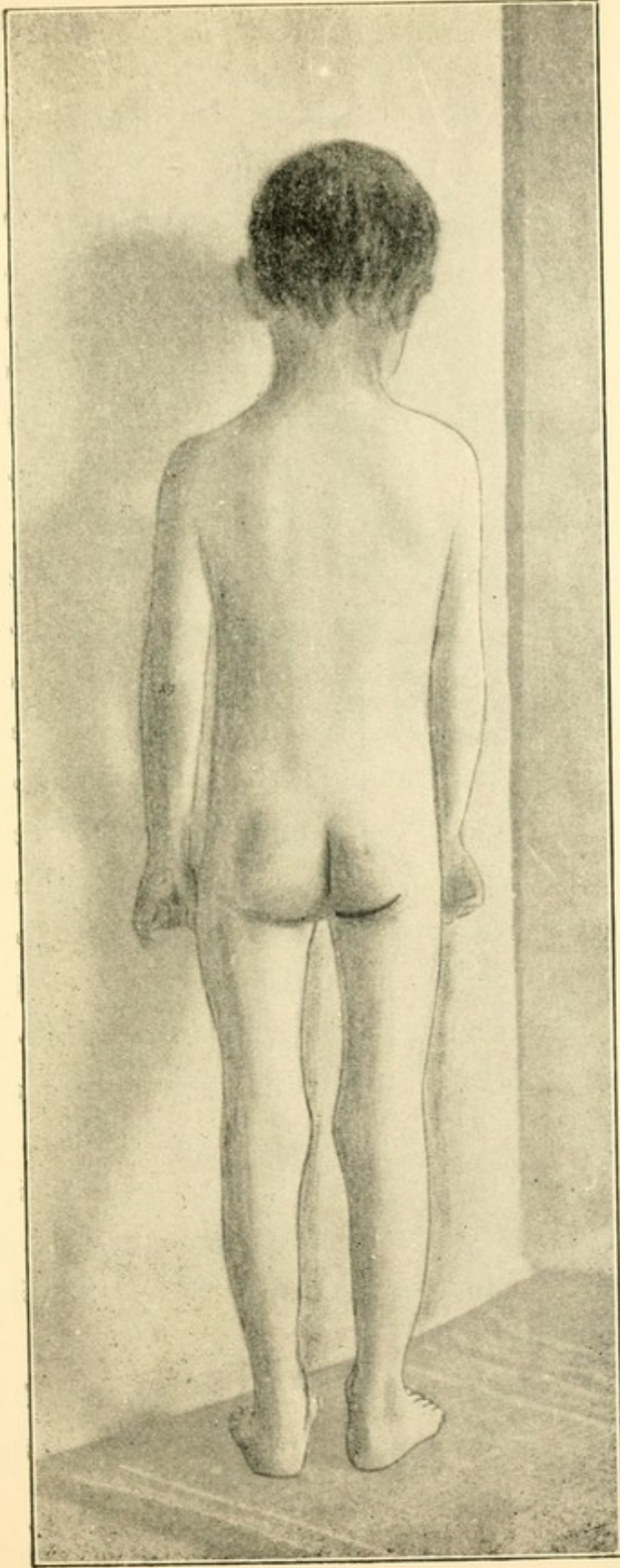


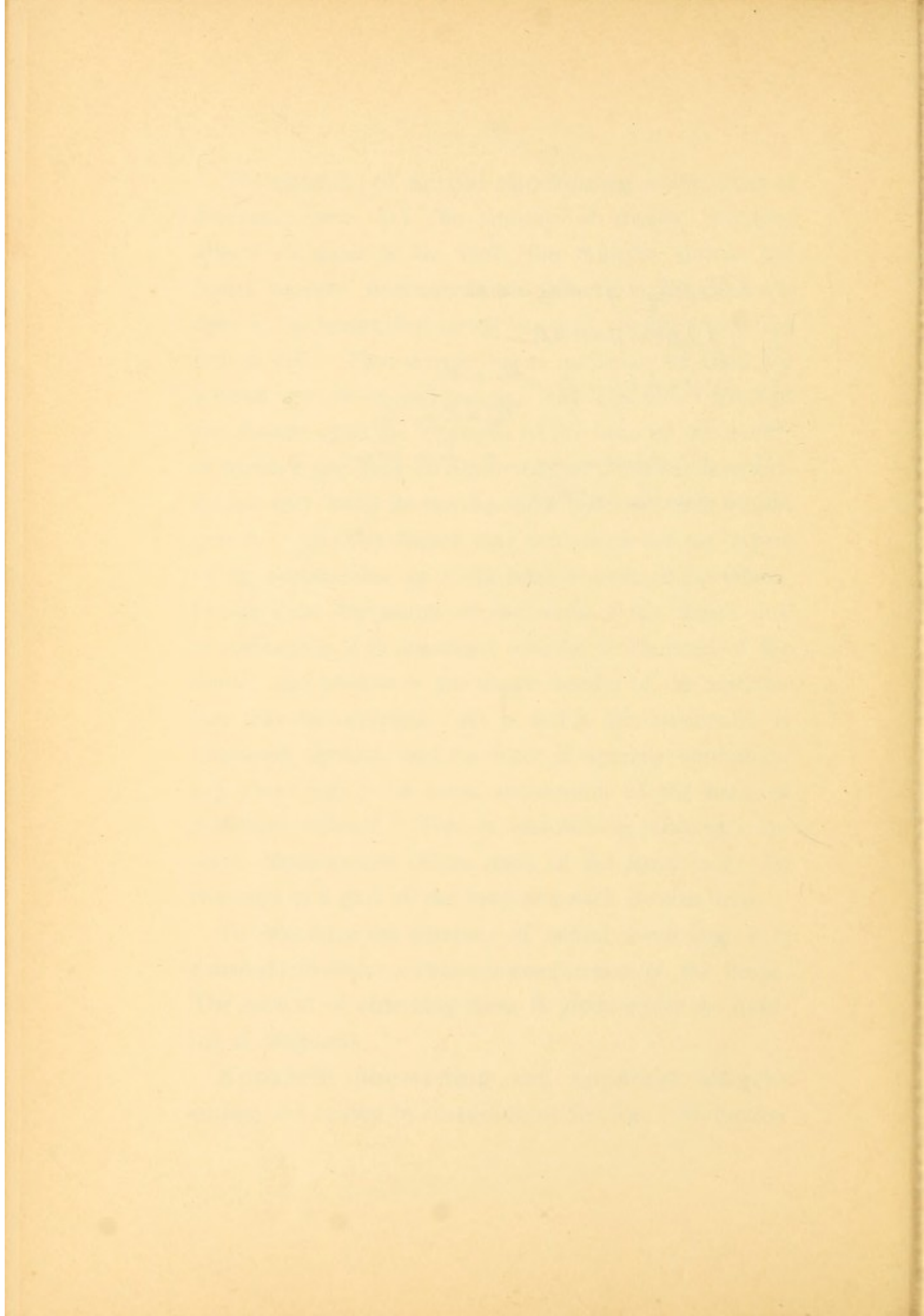
FIG. 21.—Hip Disease. Slight Flexion and Obliteration of Gluteal Fold. (R. H. Sayre.)

The **causes of actual shortening** in the order of frequency are: (1) The atrophy of disuse. Atrophy affects all parts of the limb, the muscles shrink, the bones become attenuated, and growth is retarded, not only in the femur, but in the bones of the leg and of the foot as well. Thus simple disuse accounts by itself for a small amount of shortening. (2) The direct effect of the disease upon the epiphysis of the head of the femur, of which a part may be destroyed; or premature consolidation may bring its activity to an end, and thus inhibit growth. (3) The disease may weaken or destroy a part of the acetabulum, or of the head or neck of the femur. In this class depression of the neck of the femur due to weakening of its structure, erosion of the head of the femur, and erosion of the upper border of the acetabulum may be included. As a result, the trochanter is displaced upward, and the limb is actually shortened. (4) There may be an actual dislocation of the head of the bone upward. This is uncommon, although upward displacement of the shaft of the femur after destruction of a part of the head and neck is often seen.

To determine the presence of actual shortening it is necessary to make accurate measurements of the limbs. The method of obtaining these is given under the heading of diagnosis

**Apparent shortening** and **apparent lengthening** are caused by distortion of the leg. Abduction

1. atrophy of discus.
2. Epiphyseal.
3. Erosion of head
4. " " trochanter
5. Depression of neck
6. Dislocation



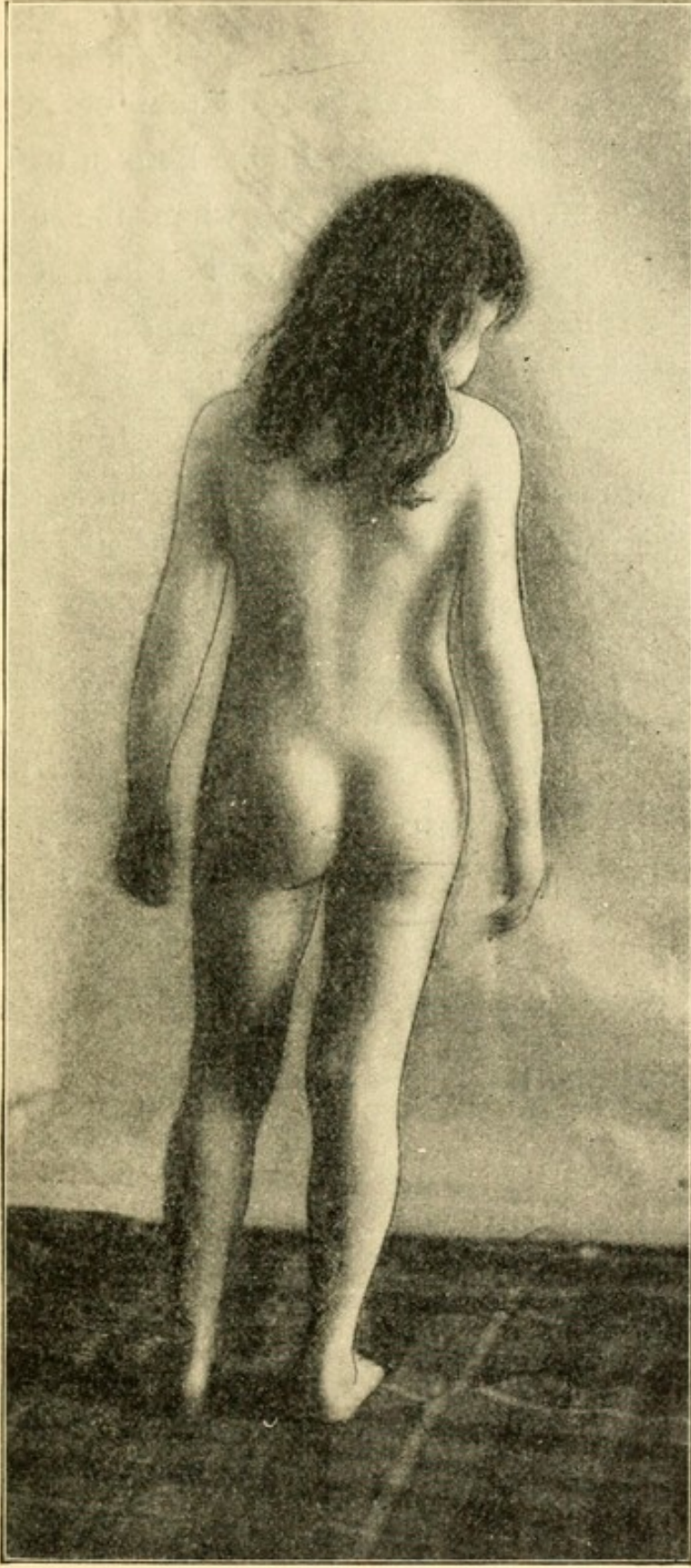


FIG. 22.—Hip Disease. Flexion and Obliteration of Gluteal Fold more marked. (R. H. Sayre.)

causes apparent lengthening, adduction apparent shortening. When one speaks of abduction or adduction as a symptom, fixed distortion of the limb in its relation to the pelvis is implied, so that when the limbs are placed side by side the pelvis must be tilted, motion in the lumbar spine replacing normal motion in the hip joint.

As apparent shortening is due to distortion, it may be overcome, while actual shortening is, of course, irremediable. As a rule, in untreated cases of hip disease actual and apparent shortening are combined.

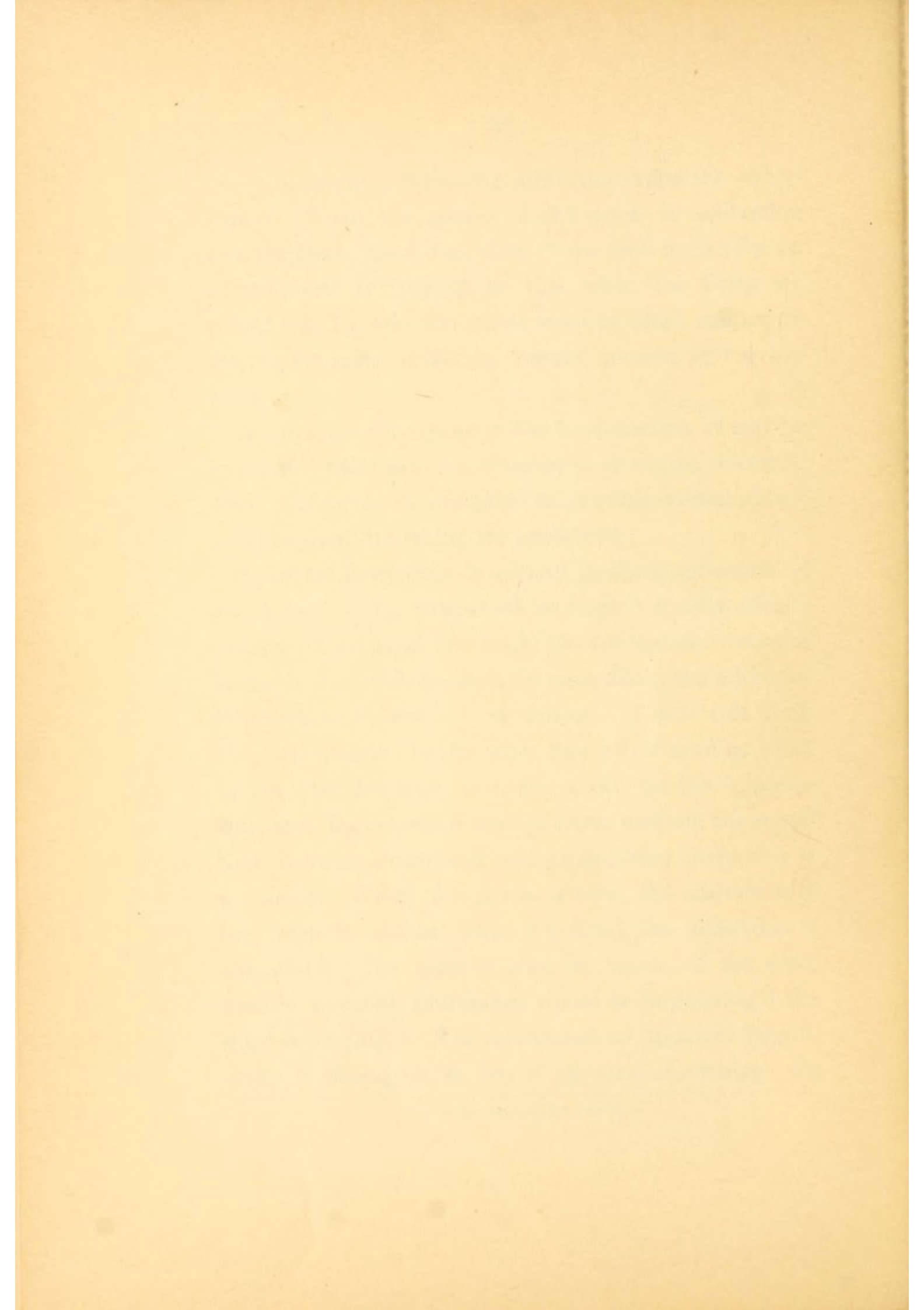
Apparent shortening is caused by fixed adduction of the thigh. If the patient whose thigh is fixed in adduction be placed upon his back, the two anterior superior spines of the pelvis lying on the same plane, the adducted thigh will be crossed over its fellow. If now this limb be placed parallel to the other, the pelvis must be tilted up on the deformed side, and down on the opposite side; thus the deformed limb is drawn upward, the sound limb is forced downward, and an apparent inequality is produced. When the pelvis is level, the adduction of the thigh is evident; when it is tilted, the adduction is concealed. The same is true, of course, of the erect posture; apparent shortening would be impossible if the spine were rigid.\* The mechanism of apparent lengthening is analogous to that of apparent shortening, the

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\* Give the reasons for this fact.







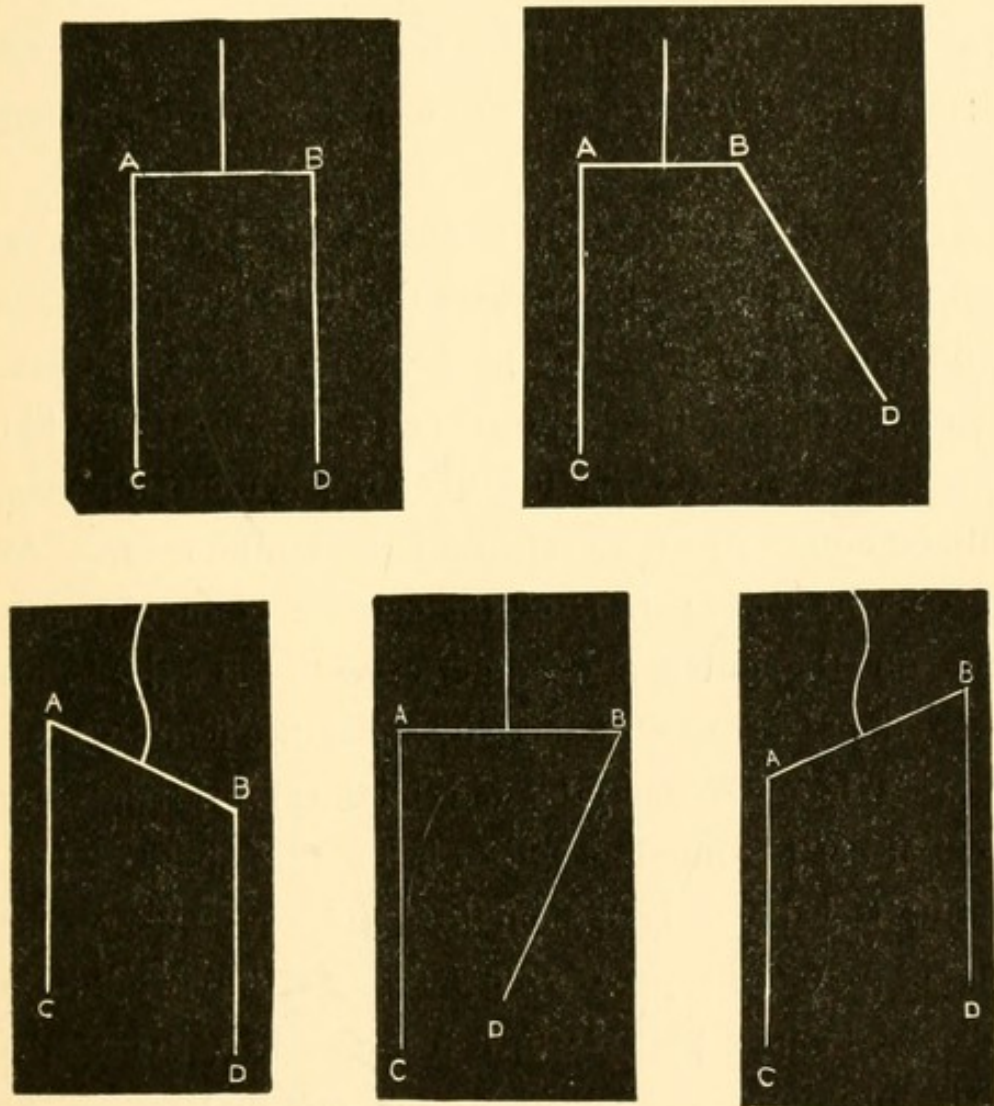


FIG. 23.—Marsh's Figures, illustrating the Tilting of the Pelvis, the Apparent Shortening or Lengthening of the Limb, and the Compensatory Curvature of the Spine.

pelvis being tilted downward by the fixed abduction of the thigh.\* Fixed flexion or contraction-deformity produces an increased hollowness (lordosis) of the back on account of the compensatory action of the spine. † The methods for determining the angles of flexion, adduction and abduction are given in the section on diagnosis.

**Abscess.**—Demonstrable abscess is present in at least 25 per cent. of the cases that have received treatment, and in a much larger proportion of those that have been neglected. The appearance of an abscess is often preceded by an exacerbation of more acute symptoms, and sometimes by an elevation of the temperature. An abscess which has perforated the capsule commonly presents on the outer and upper aspect of the thigh, between the sartorius and the tensor vaginæ femoris muscles. It is not often attended by local heat or pain, unless it has become infected or is on the point of perforating the skin. Less often the abscess presents on the inner or posterior aspect of the thigh, or if the acetabulum is diseased and is perforated, it may find its way into the pelvis and burrow forward to the inguinal region, or backward to the neighborhood of the anus.

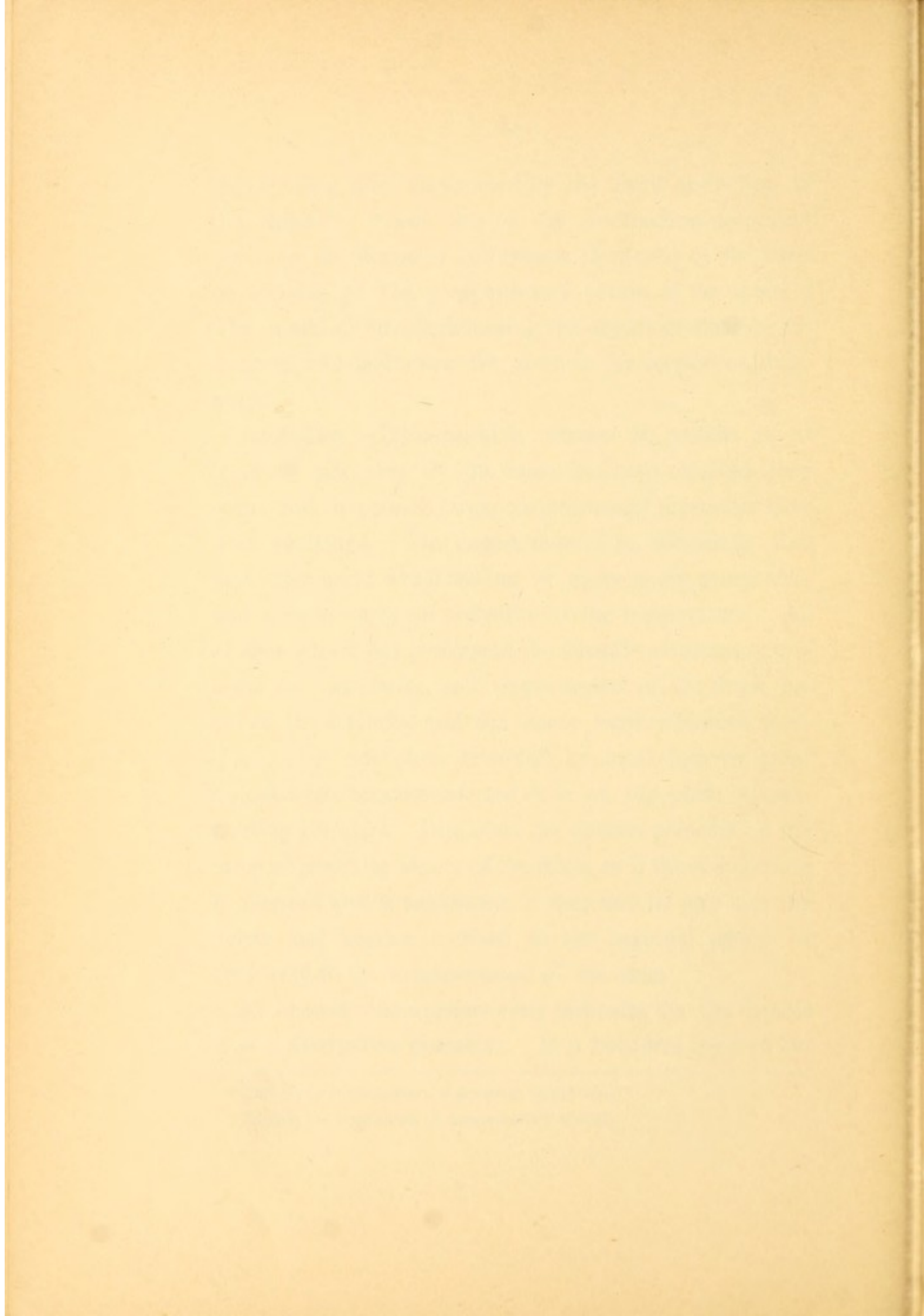
An abscess that appears early indicates that the disease is of a destructive character. If it becomes infected be-

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\* Describe the mechanism of apparent lengthening.

† Explain the mechanism of compensatory lordosis.





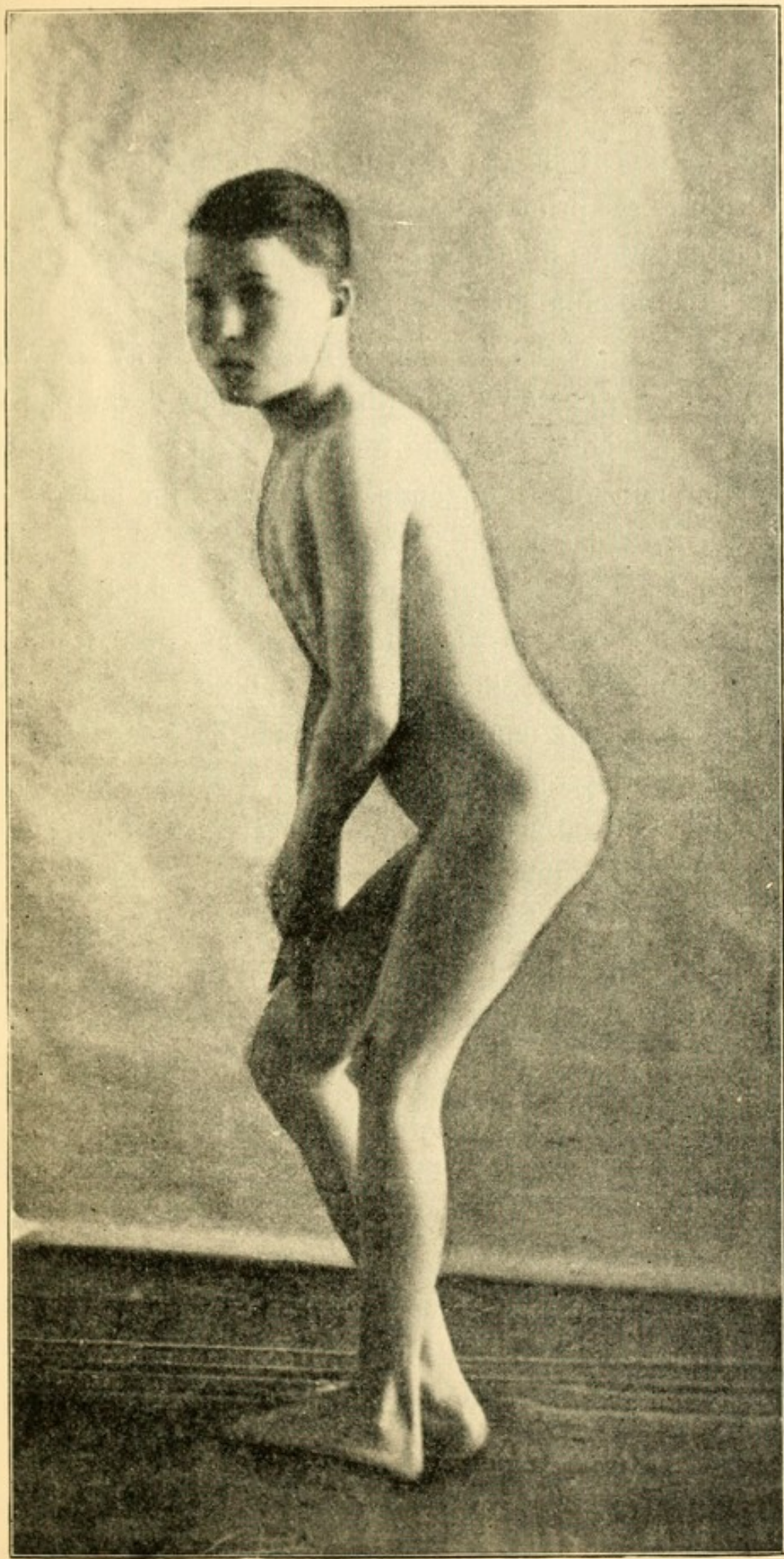


FIG. 24.—Improperly Treated Hip Disease. Ankylosis in Flexion. (R. H. Sayre.)

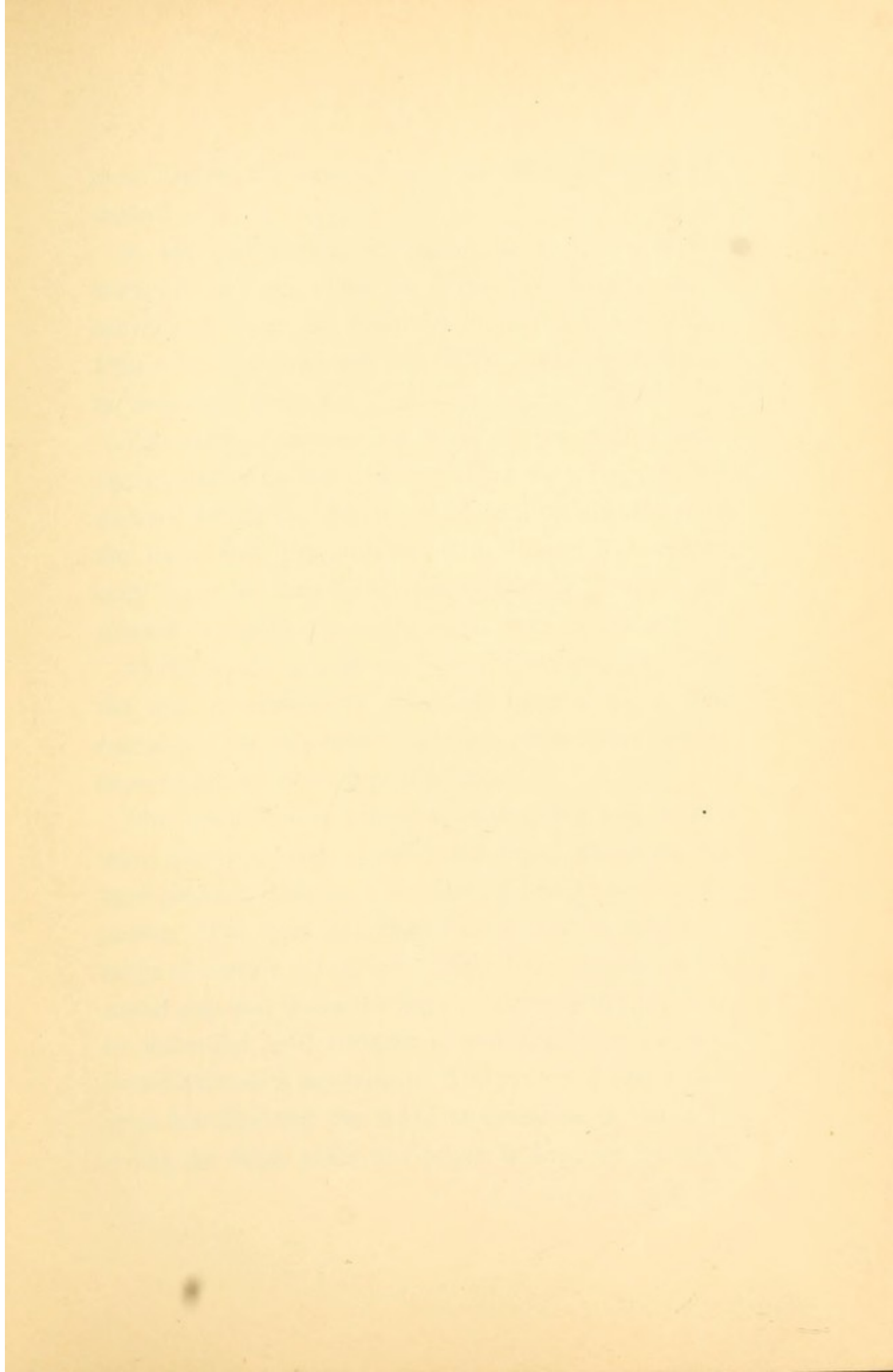
fore or after it finds an exit, it adds a dangerous complication to the primary disease, but the limited collections of tuberculous fluid that appear and cause no symptoms are of little moment.

**PROGNOSIS.—As to Life.**—The mortality is from 10 to 20 per cent., varying with the quality of the patient and the character of the treatment. Long-continued suppuration following septic infection is the most dangerous complication.

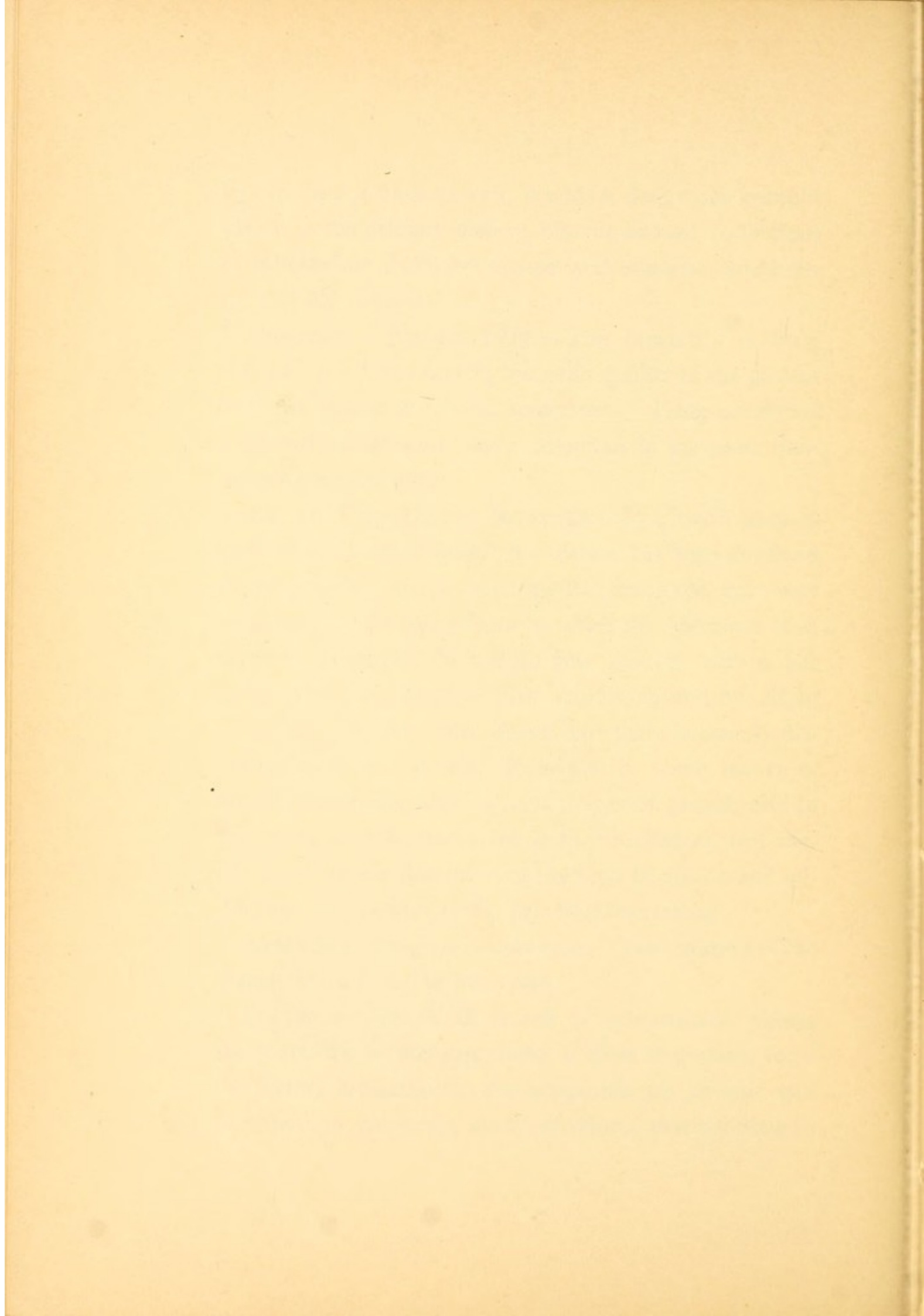
**As to Functional Results.**—In a small proportion of the cases in which the disease has been confined to the interior of the bone, perfect functional cure may be attained. In many cases in which the joint has been carefully protected, the patient may recover with a fair range of motion, with but little shortening and but slight disability. In the more severe type there is usually disorganization of the joint, from one to three inches of actual shortening, due in part to loss of growth and in part to upward displacement of the trochanter, and usually more or less distortion of the limb in flexion and adduction, which adds to the practical shortening.

Absolute ankylosis is uncommon. The duration of the disease is from two to five years.

**DIAGNOSIS.**—As in all forms of tuberculous disease the duration of the symptoms is most important, for if the history indicates that the symptoms are chronic and persistent in character, many affections, that simulate in







some degree the symptoms of hip disease, may be excluded.

As has been stated, the significant symptom in the history is the limp, which has appeared without adequate cause, and which has remained for weeks and months. Pain referred to the knee, especially pain at night, is also an important symptom.

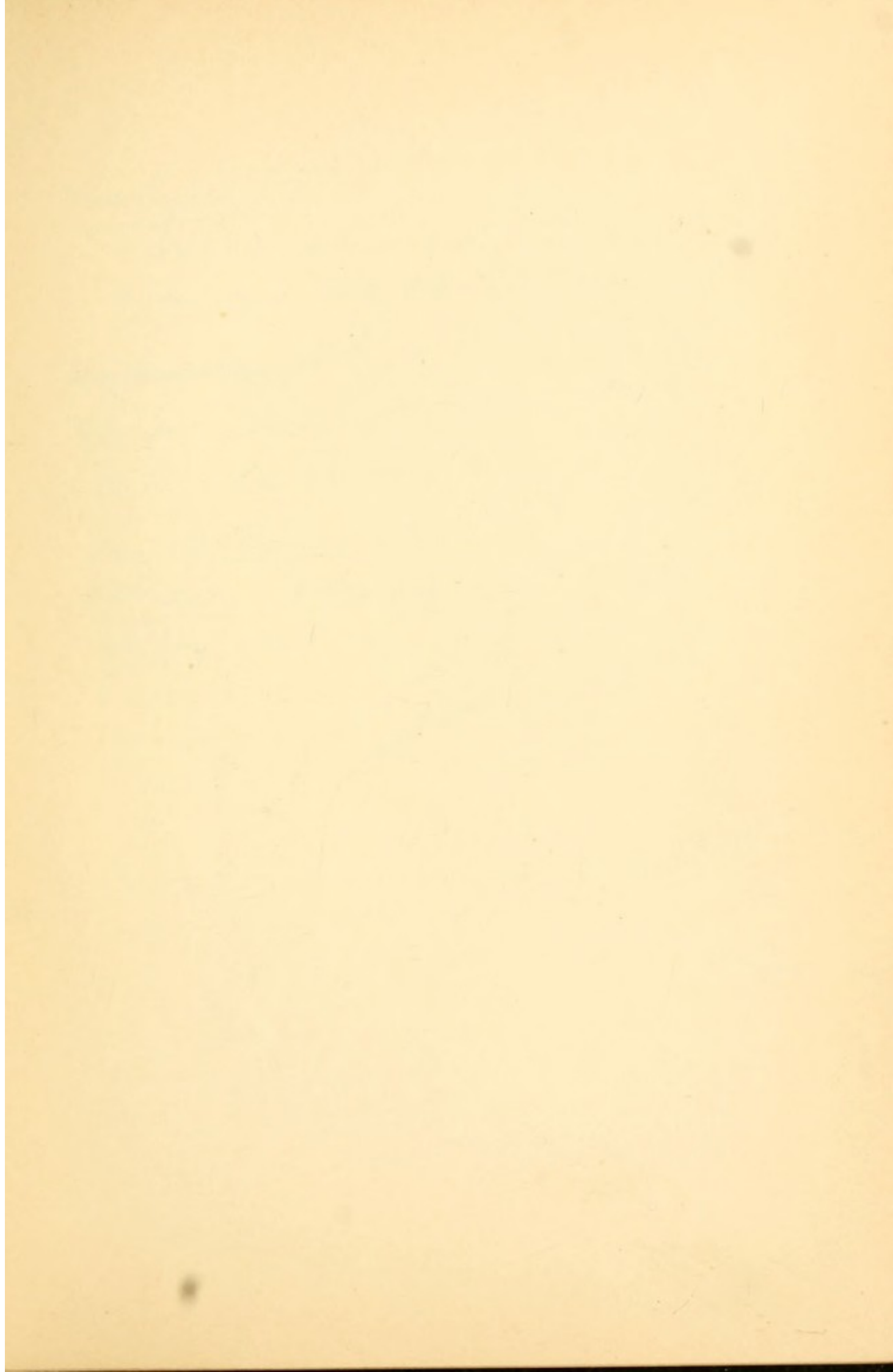
The physical examination is, of course, of far greater importance than the history. One first inspects the patient, noting the general condition, the character of the limp, and the attitude of the limb. This in the early stage is usually abducted, slightly flexed, and rotated outward, apparently longer than its fellow.

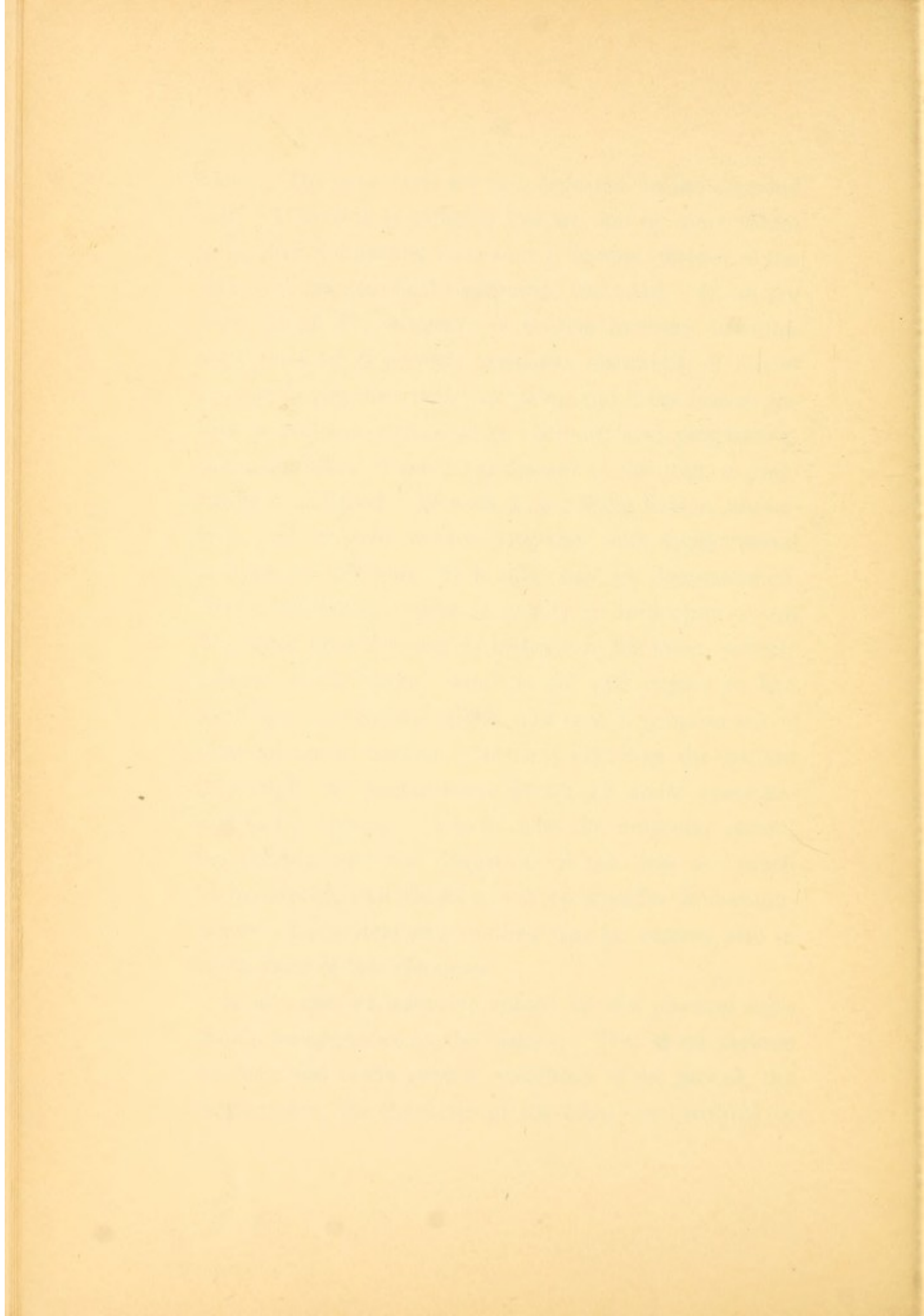
As the patient stands erect, one notes the contour of the hip, comparing it with the opposite side. The causes and the significance of these changes have already been explained in the preceding pages.

The patient is then placed upon the table, and the anterior superior spines of the pelvis being placed on the same plane, distortion of the limb, if present, will be apparent. The most important test is that of the relative range of motion of the two joints. One begins on the sound side and forces the limb to extreme flexion, then to abduction, and adduction, and finally the range of circumduction is ascertained. The patient is next turned upon his face and the range of extension is tested by raising the thigh while the pelvis is fixed by the other

hand. The same tests are then repeated on the diseased side. If motion is perfectly free in one or more directions, and if muscular resistance is absent, disease of the joint may be, practically speaking, excluded. If, on the other hand, the extremes of motion in every direction are limited by a peculiar muscular resistance, if forced motion causes discomfort or pain, and if the history indicates that the symptoms are chronic and progressive, the diagnosis of tuberculous disease of the joint is practically established. In such a case slight flexion, abduction, and outward rotation, together with slight general atrophy of the limb, as a rule may be demonstrated. Actual shortening, which is usually an indication of loss of growth or of destructive changes in the joint, is rarely present at this stage. Nor should one expect to find swelling or infiltration, which, as a rule, is symptomatic of more advanced disease. In many instances the patient is brought for examination during an acute exacerbation of the disease. In such cases the muscular spasm, the rigidity, and the distortion of the limb are much more marked, and the joint may be sensitive to manipulation. Local heat and swelling may be present also in acute cases of this character.

In all cases an accurate record of the physical signs should be appended to the history. This must include a description of the general condition of the patient, the temperature, the character of the limp, the attitude of





Measurements.

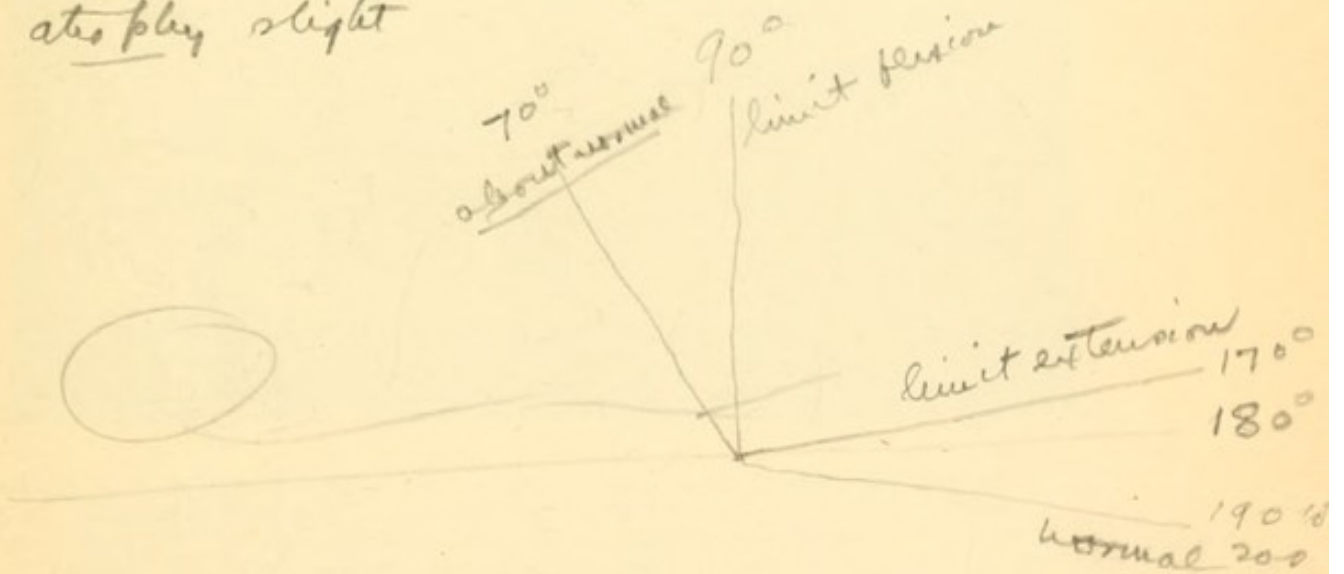
1. Patient dorsal position on table
2. anterior sup. spines level

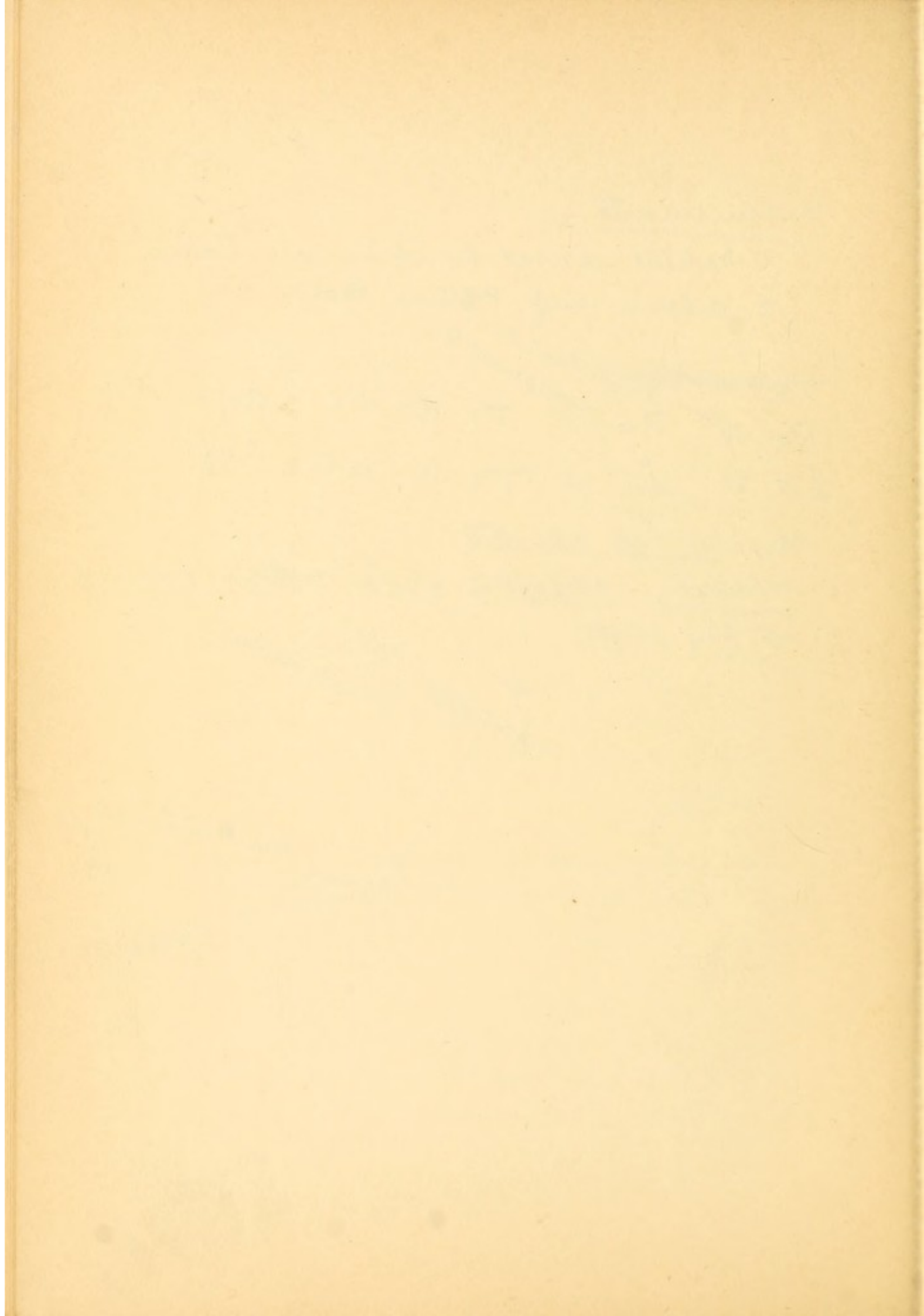
~~Right and Left~~ actual S.  
apparent S.

Ra 21	Ru 25	T9	K7	C6	Age	170
La 21	Lu 26	T8	K7	C5	Age	90

thus left hip affected

deformity. abduction flexion rotation outward.  
atrophy slight





the extremity, the range of motion, the amount of distortion, and the like.

**Mensuration.**—The length of the limbs is ascertained by measurements from the anterior superior spines of the ilium to the extremities of the internal malleoli; the relative size by measuring the circumference of the

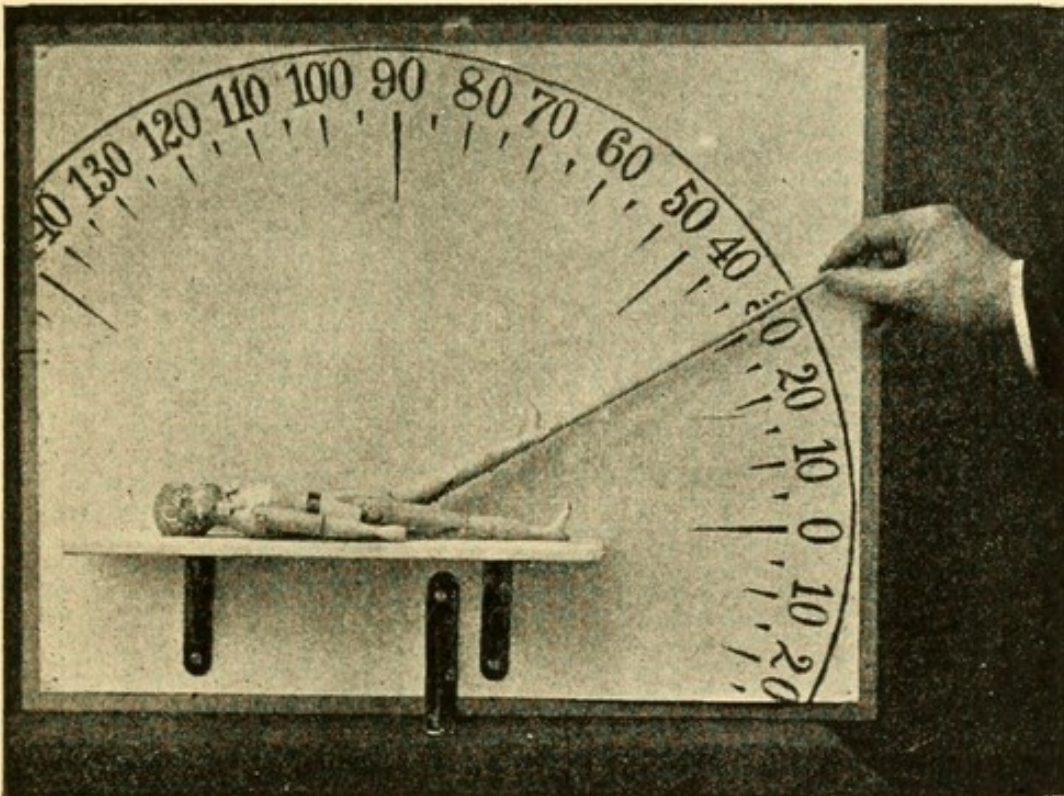


FIG. 25.—Judson's Figure of a Doll, illustrating the Method of Measuring the Degree of Flexion. (The flexed leg is raised until the lumbar section of the spine lies upon the table; the degree of permanent flexion is then measured. It is more convenient to use the angle formed by the leg with the body, thus the flexion indicated by 30 degrees in the cut would be recorded as 150 degrees.)

thighs and calves at corresponding points. If **actual shortening** be present, one must distinguish between that caused by loss of growth and that due to upward displacement of the trochanter. This may be decided



by Nélaton's line. Nélaton's line is a line drawn from the anterior superior spine to the center of the tuberosity of the ischium, which normally touches the top of the trochanter, provided the limb is neither adducted nor abducted. Bryant's triangle allows a more direct comparison of the two sides. It is measured as follows:

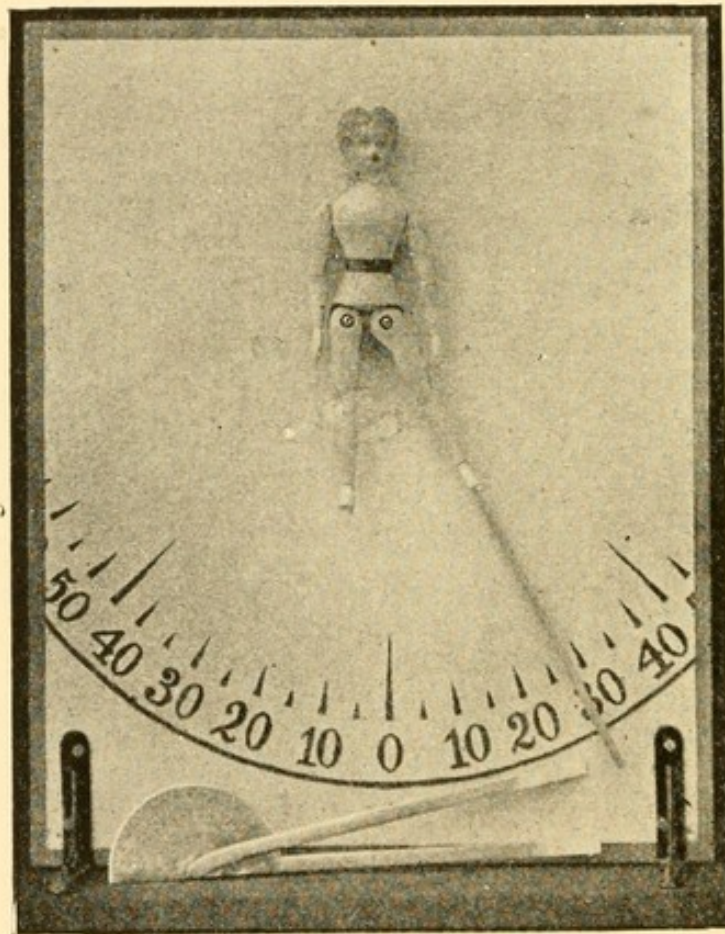
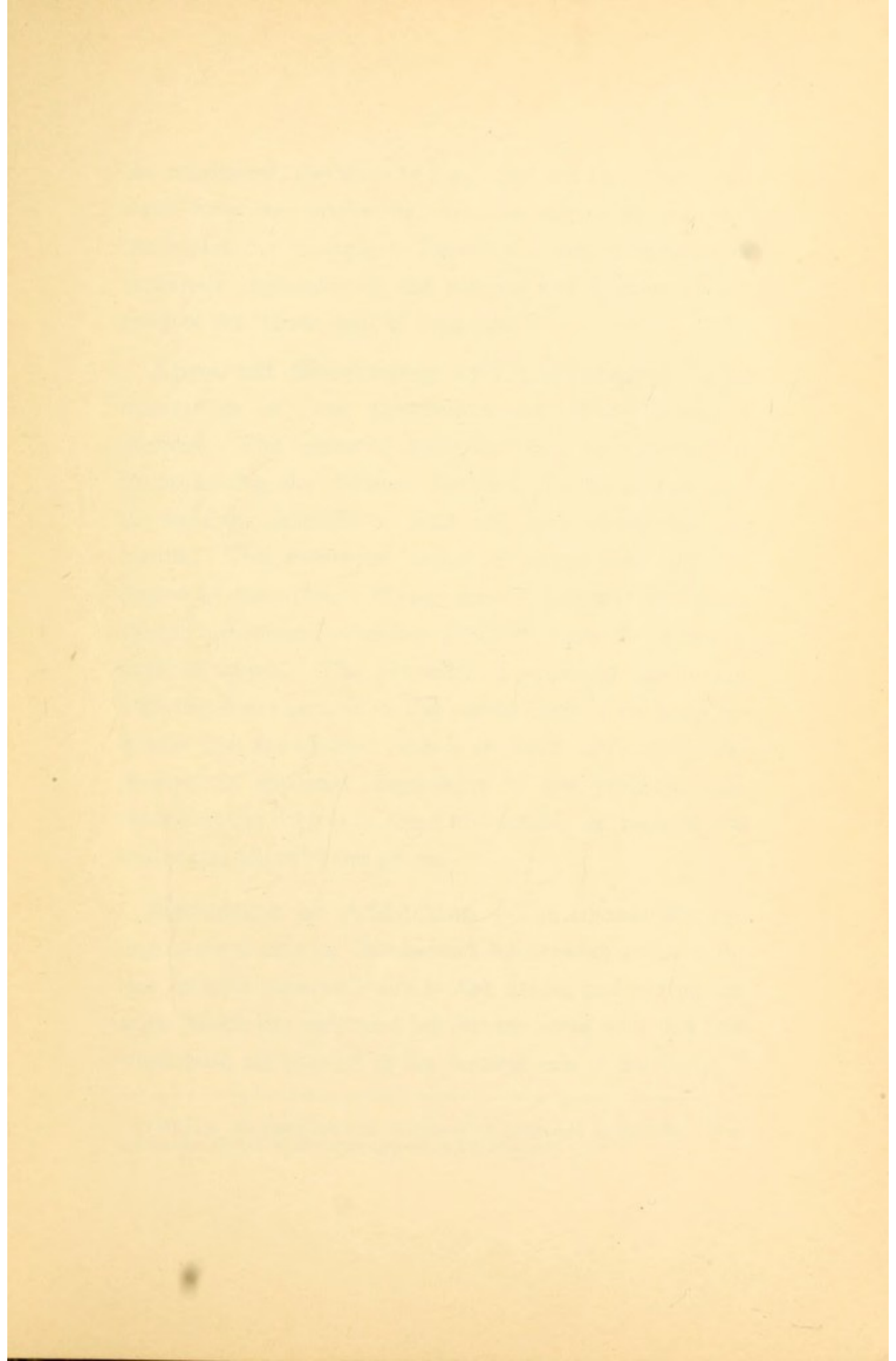


FIG. 26.—Judson's Figure of a Doll, illustrating the Method of Measuring the Degree of Distortion. The patient having been placed upon the table with the anterior superior spines of the pelvis on the same plane, the distortion of the leg in abduction or adduction becomes apparent and may be measured by means of a goniometer.

The patient lying in the recumbent position, a line is drawn directly backward from the anterior superior spine, and another from the same point to the apex of





the trochanter; the third or base-line, drawn directly upward from the trochanter, connects the other two and completes the triangle. These two measurements are especially important in the diagnosis of fracture of the neck of the femur, and of coxa vara.\*

**Apparent Shortening or Lengthening.**—The mechanism of these phenomena has already been explained. The degree of distortion may be determined by measuring the distance between the umbilicus and the internal malleolus on each side, and comparing the results. The difference varies in proportion with the degree of distortion. Measurements from the umbilicus should correspond relatively to those from the anterior superior spines. The presence of apparent shortening with the limbs parallel to the vertical axis of the body indicates that the affected limb is in fixed adduction; the presence of apparent lengthening in this position indicates that the limb is in fixed abduction, as regards the horizontal plane of the pelvis.

**Abduction or Adduction.**—The amount of either one of these may be determined by drawing a line from one anterior superior spine to the other, and noting the angle which the right and left femora form with this line when both are parallel to the vertical axis of the body.

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\* What is the significance of increased or decreased prominence of the trochanter when it is displaced upward in hip disease?

**Flexion and Extension.**—If fixed flexion be present, the lumbar spinous processes and the popliteal space can not touch the table at the same time when the child is placed upon its back. If the popliteal space be pressed against the table, the lumbar spines are lifted from the level of the table, and a space is formed under the child's body in the region of the lumbar lordosis. If the affected limb be lifted up (flexed) sufficiently to make the lumbar spines touch the table again, the angle of flexion may be measured by noting the angle which the flexed limb forms with the trunk.

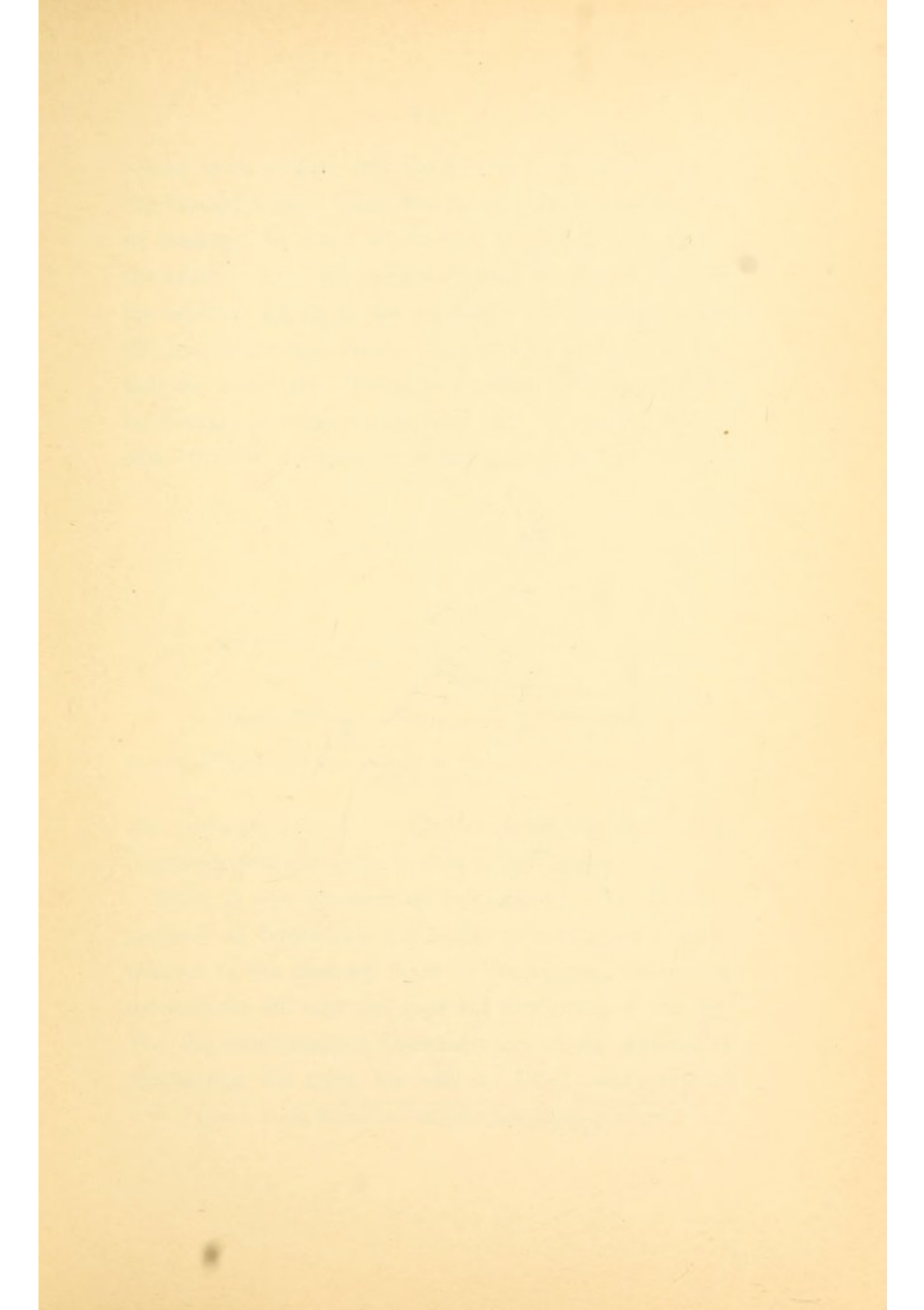
This angle indicates the limit of extension. The thigh is then flexed until resistance is encountered, and this angle indicates the limitation of motion in the direction of flexion. These angles show at a glance the amount and character of the distortion of the limb and the restriction of motion.

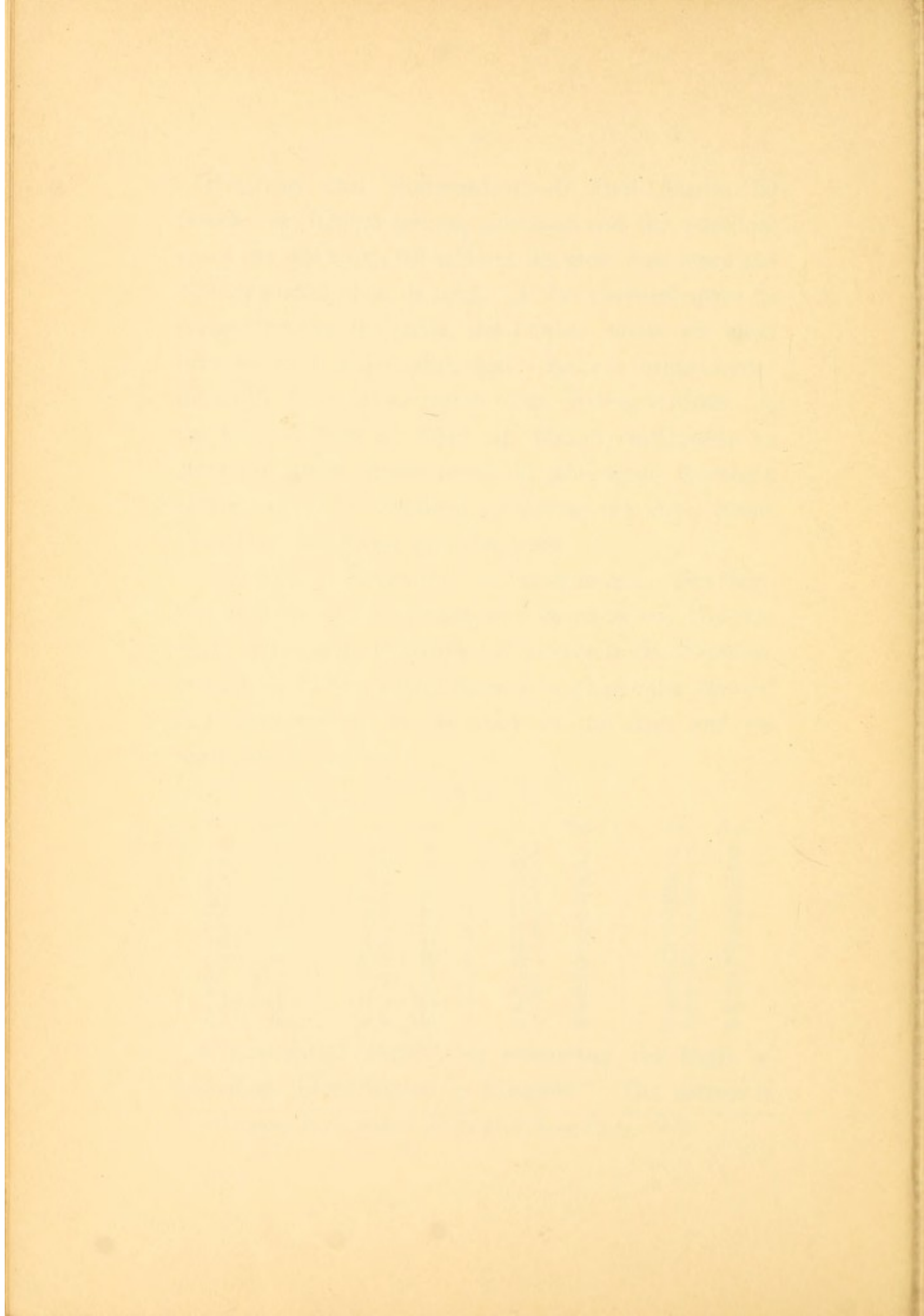
TABLE I.

<i>In.</i>	<i>Deg.</i>	<i>In.</i>	<i>Deg.</i>	<i>In.</i>	<i>Deg.</i>	<i>In.</i>	<i>Deg.</i>
.5	1	6.5	16	12.5	31	18.5	50
1.0	2	7.0	17	13.0	33	19.0	52
1.5	3	7.5	19	13.5	34	19.5	54
2.0	4	8.0	20	14.0	36	20.0	56
2.5	6	8.5	21	14.5	37	20.5	58
3.0	7	9.0	22	15.0	39	21.0	60
3.5	9	9.5	24	15.5	40	21.5	63
4.0	10	10.0	25	16.0	42	22.0	67
4.5	11	10.5	27	16.5	43	22.5	70
5.0	12	11.0	28	17.0	45	23.0	75
5.5	14	11.5	29	17.5	47	23.5	80
6.0	15	12.0	30	18.0	48	24.0	90

A convenient method for measuring the angle of flexion has been devised by Kingsley.\* The patient is

\*Kingsley, *Boston Medical and Surgical Journal*, July 5, 1888.





placed upon a table, and the diseased limb flexed until the lumbar spines touch the table. It is now desired to measure the angle which the flexed leg makes with the table. For this purpose, measure off two feet on the external aspect of the leg with a tape measure, with the zero of the tape on the table at (*A*) in Fig. 27, and note the point (*B*). From here measure the perpendicular distance in inches to the table (*C*). Consult Table I, and opposite the number of inches, found by means of

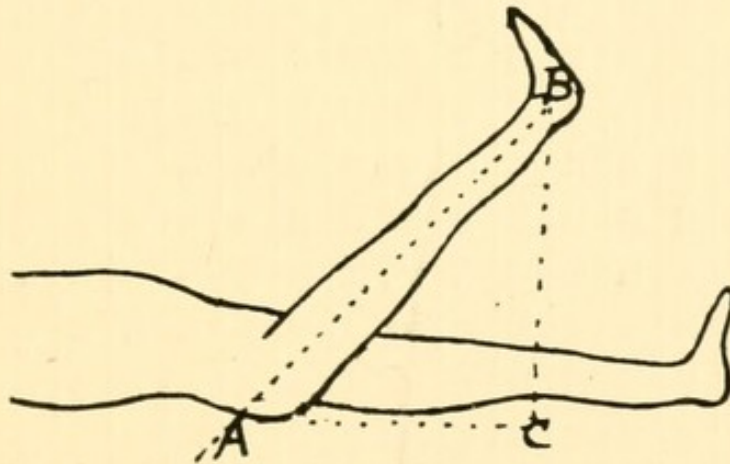


FIG. 27.—Diagram showing Method of Measuring the Angle of Flexion. (After Kingsley.)

the measurement *B C*, will be found the number of degrees representing the flexion of the diseased leg.

Table II was constructed by Lovett.\* It shows a method of estimating the angle of adduction or abduction of the diseased limb by the varying differences between the real and the apparent shortening of the leg. For the mathematical demonstration of the method of calculating the table we refer to Dr. Lovett's article.

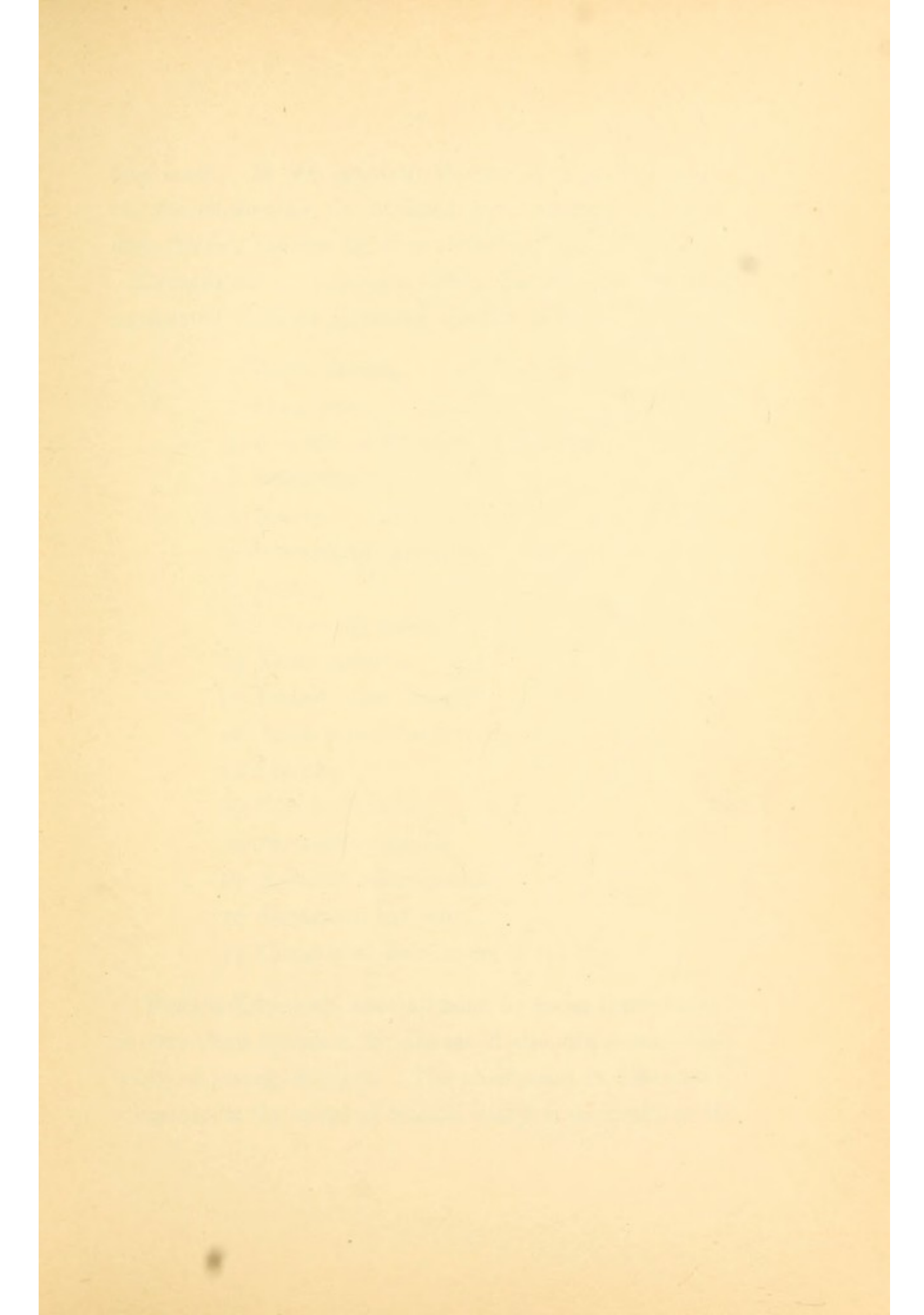
\* Lovett, *Boston Medical and Surgical Journal*, March 8, 1888.

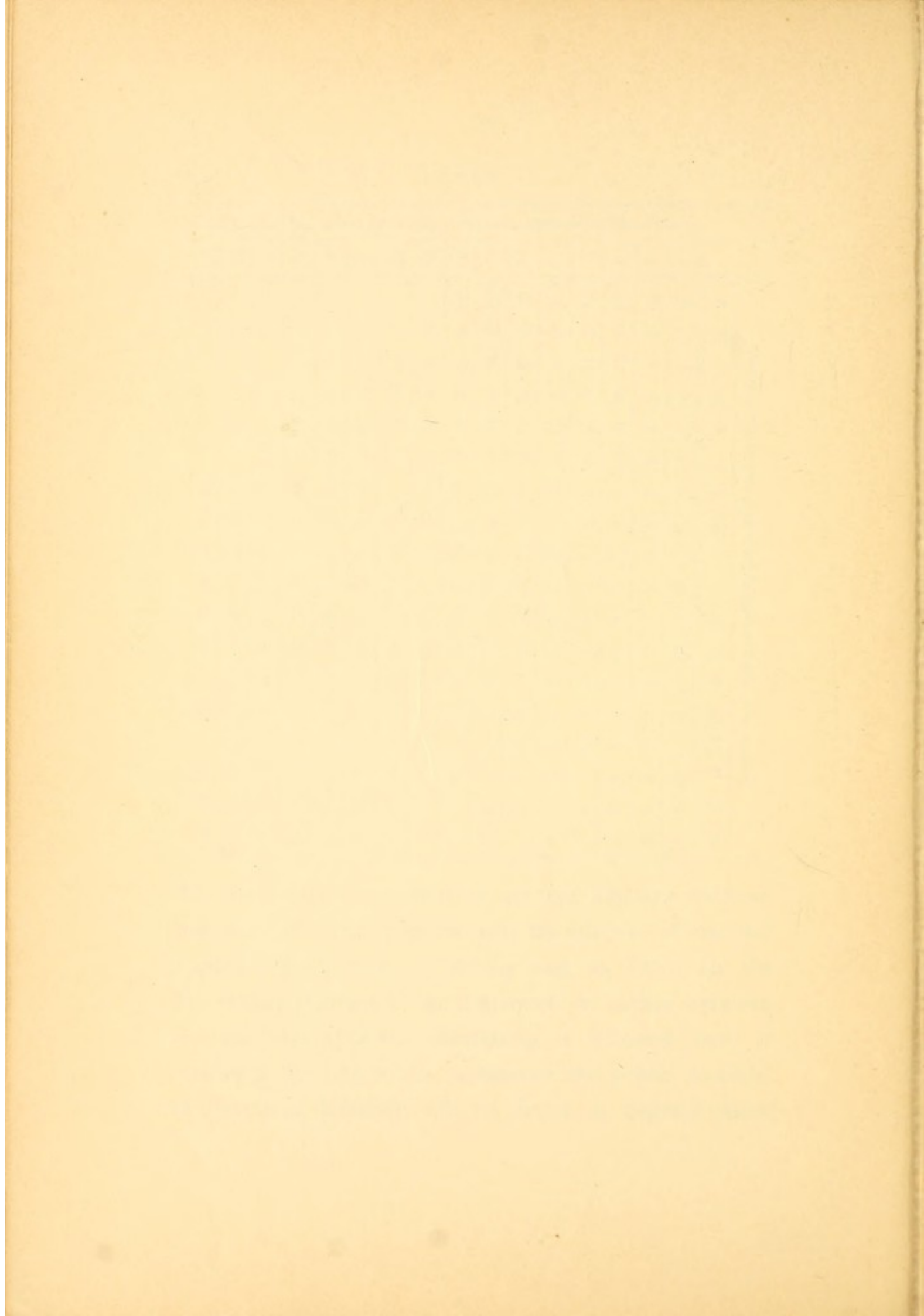


TABLE II.

Difference in inches between Real and Apparent Shortening.		Distance between Anterior Superior Spines in inches.																		
		3	3½	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	11	12	13	
½	5°	4°	4°	3°	3°	2°	2°	2°	2°	2°	2°	2°	2°	2°	2°	1°	1°	1°	1°	
½	10	8	7	6	5	5	4	4	4	4	4	4	4	4	3	3	3	3	2	
¾	14	12	11	10	8	8	7	7	6	6	5	5	5	4	4	4	4	3	3	
1	19	17	14	13	11	10	9	9	8	7	7	7	7	6	6	5	5	5	4	
1¼	25	21	18	16	14	13	12	11	10	9	9	8	8	8	7	7	7	6	6	
1½	30	25	22	19	17	15	14	13	12	12	11	10	10	9	9	8	8	7	7	
1¾	36	30	26	23	20	18	17	15	14	13	13	12	11	10	10	9	8	8	8	
2	42	35	30	26	23	21	19	18	16	15	14	14	13	12	12	10	10	9	9	
2¼	..	40	34	30	26	24	21	20	19	17	16	15	14	14	13	12	11	10	10	
2½	..	..	39	34	29	27	24	22	21	19	18	17	16	15	14	13	12	11	11	
2¾	..	..	..	38	32	29	27	25	23	21	20	19	18	17	16	14	13	12	12	
3	..	..	..	..	42	35	32	29	27	25	23	22	21	19	18	16	14	13	13	
3¼	..	..	..	..	..	39	36	32	30	27	26	25	22	21	20	19	17	15	14	
3½	..	..	..	..	..	..	40	35	33	30	28	26	24	23	22	21	19	17	16	
3¾	..	..	..	..	..	..	..	38	35	32	30	28	26	25	23	22	20	18	17	
4	..	..	..	..	..	..	..	..	42	38	35	32	30	28	26	25	23	21	19	18

The necessary measurements are the distance between the anterior superior spines, and the amount of real and apparent shortening. Turning now to Table II, the line which represents the difference in inches between the real and apparent shortening is followed until it intersects the line which represents the pelvic breadth, the angle of deformity will be found in degrees where





they meet. If the apparent shortening is greater than the real shortening, the diseased leg is adducted; if less than the real shortening, it is abducted.

**DIFFERENTIAL DIAGNOSIS.**—Hip disease must be differentiated from the following conditions:—

- 1 Pott's disease,
- 2 Coxa vara,
- 3 Fracture of the neck of the femur,
- 4 Rheumatism,
- 5 Scurvy,
- 6 Rheumatoid arthritis,
- 7 Strain,
- 8 "Growing pains,"
- 9 Acute synovitis,
- 10 Periarticular disease,
- 11 Acute infectious arthritis,
- 12 Syphilis,
- 13 Gluteal bursitis,
- 14 Sacro-iliac disease,
- 15 Anterior poliomyelitis,
- 16 Hysterical hip joint,
- 17 Congenital dislocation of the hip.

**Pott's Disease**, accompanied by psoas contraction, is very often mistaken for disease of the hip joint, especially in young children. The chief point in differential diagnosis is the range of motion which is restricted in all

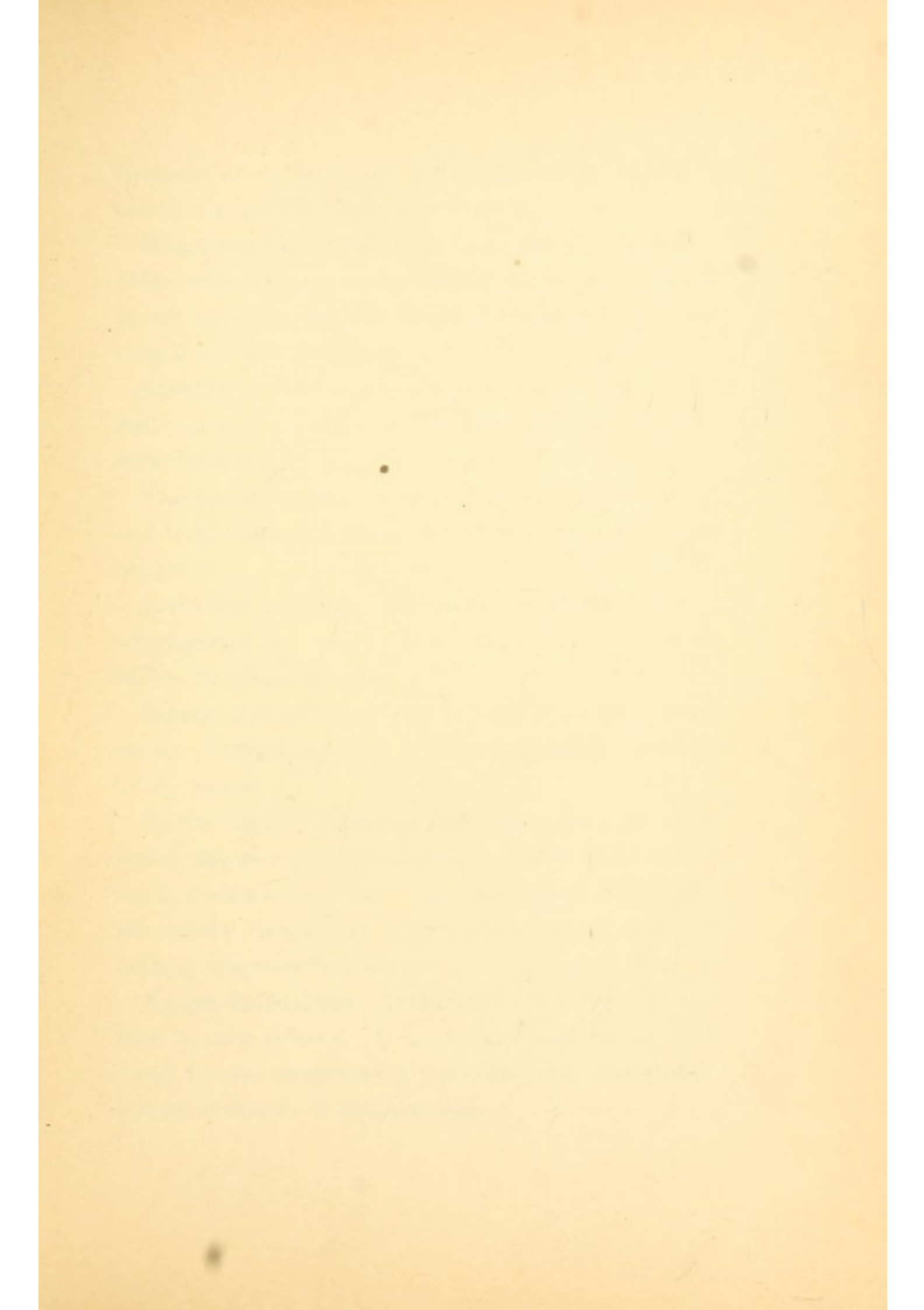
directions in hip disease, whereas when the joint is normal, as in Pott's disease, and the leg is simply flexed by the traction of the ilio-psoas muscle, motion is free in those directions that do not oppose the contracted muscle. Pott's disease in infancy is sometimes accompanied by a sympathetic spasm of the muscles of the hip, and it may be, for a time, difficult to differentiate from disease of the hip.

**Coxa Vara.**—This is a depression of the neck of the femur due to weakening of its structure. It corresponds to genu varum and valgum, as its name indicates. The femoral neck is usually depressed backward, consequently the trochanter is elevated and becomes prominent. The foot is rotated outward. Motion is not limited equally in all directions, nor is it checked by muscular spasm. The restriction affects the range of abduction, and, in a minor degree, the range of flexion. Actual shortening is always present.

**Fracture of the Neck of the Femur** in childhood is sometimes mistaken for hip disease during and after the stage of repair. It is practically a form of traumatic coxa vara.

**Rheumatism** is not usually limited to one joint. It is generally of sudden onset, and, as a rule, it is of short duration.

**Scurvy** in infancy resembles rheumatism more closely than tuberculous disease. The age of the patient, the





character of the food, and the confirmatory evidence of scurvy will indicate the cause of the symptoms.

**Rheumatoid Arthritis** is a chronic disease of older subjects, occasionally limited to a single joint, and, in rare instances, the distinction between the two affections is not well defined.

**Strains** of the hip may simulate disease very closely, but, as a rule, there is a history of sudden onset and the recovery is rapid.

“**Growing pains**” may be due to over-exertion, or to a mild form of rheumatism. Recovery is rapid and complete.

**Anterior poliomyelitis** in the early stage may be accompanied by pain. The appearance of paralysis makes the diagnosis clear.

**Acute Synovitis.** This is usually a more severe variety of sprain or injury, the swelling being explained by the history.

**Periarticular Disease and Abscess.**—In periarticular disease the local sensitiveness and the local swelling first attract attention. The movements of the joint are usually free, unless tension upon the painful parts induces voluntary resistance.

**Acute Infectious Arthritis.**—This is more common in early infancy. It is characterized by an acute onset, by the symptoms of constitutional disturbance, and by evidences of pus-formation.



**Syphilitic disease** is rarely limited to one joint. The evidences of the acquired or of inherited disease are usually present.

**Bursitis.**—Inflammation and enlargement of one of the bursæ about the hip, commonly of that between the trochanter and the gluteal muscle, causes a localized swelling, unaccompanied by symptoms unless it becomes inflamed, when it resembles periarticular rather than central disease of the joint.

**Sacro-iliac Disease.**—In this affection the movements of the joint are painless if the pelvis be fixed, so that the sensitive articulation is protected.

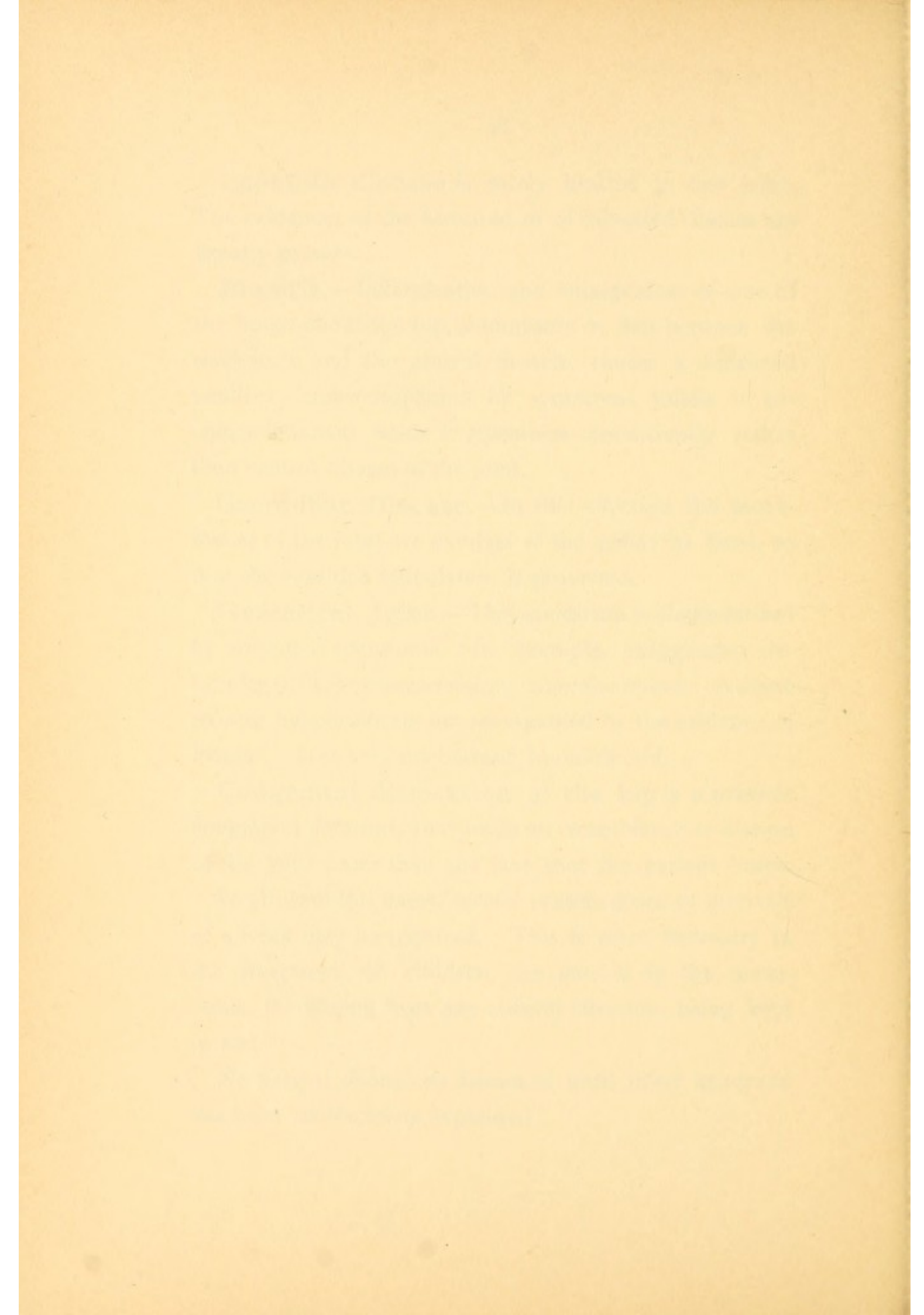
**Hysterical Joint.**—This condition is characterized by irregular symptoms,—for example, exaggerated deformity without corresponding muscular spasm; extreme pain or hyperæsthesia unaccompanied by the evidence of disease. It is very uncommon in childhood.

**Congenital dislocation of the hip** is a painless congenital deformity that bears no resemblance to disease of the joint other than the fact that the patient limps.

In all doubtful cases, several examinations at intervals of a week may be required. This is often necessary in the treatment of children, the patient in the meanwhile, if suffering from any painful affection, being kept in bed.

No patient should be dismissed until every symptom has been satisfactorily explained.

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TREATMENT.—This must be constitutional and mechanical, and, if necessary, it may be supplemented by surgical intervention. The principles of the constitutional treatment of tuberculous affections have been indicated elsewhere. The object of mechanical treatment is to place the joint at rest and to prevent deformity, which is inevitable if the patient is neglected. During the entire course of treatment the limb must be supported in the normal position, and the first step in treatment is the reduction of whatever deformity the patient may present when the treatment is begun.

This deformity is, in great degree, the result of muscular spasm, but it is often confirmed by adaptive shortening of the muscles and fasciæ. It may be reduced by traction in the line of deformity\* by means of the weight and pulley or traction apparatus†, by the successive applications of the plaster bandage, or by forcible manipulation under anæsthesia.

The first is the favorite method with most surgeons. The patient is fixed in bed, and the leg elevated until the lumbar lordosis is obliterated and moved to one or other side until the pelvis is level. In this attitude it is supported, and traction is applied by means of lateral strips of adhesive plaster, extending from the ankle to the hip, provided with buckles at the lower end. To these is

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(\*) Why does one make traction in the line of deformity?

(†) In what cases is it impossible to reduce deformity by this means?

attached a rope which passes over a pulley at the proper height. One begins with a traction weight of five pounds, and increases it from day to-day to the point of toleration. Counter-traction on the perineum is usually necessary.

As the deformity lessens, the position of the limb is changed from day to-day. Finally, it may be placed beside its fellow without tilting the pelvis. The same degree of traction may be applied by the hip splint, if the apparatus be at hand.

If the deformity is not particularly resistant, it may be reduced by slight manual traction and by the rest that is assured by a closely fitting plaster bandage extending from the axillæ to the toes.\* This method is particularly applicable to the treatment of young children. The bandage is renewed at intervals of from two to three weeks.

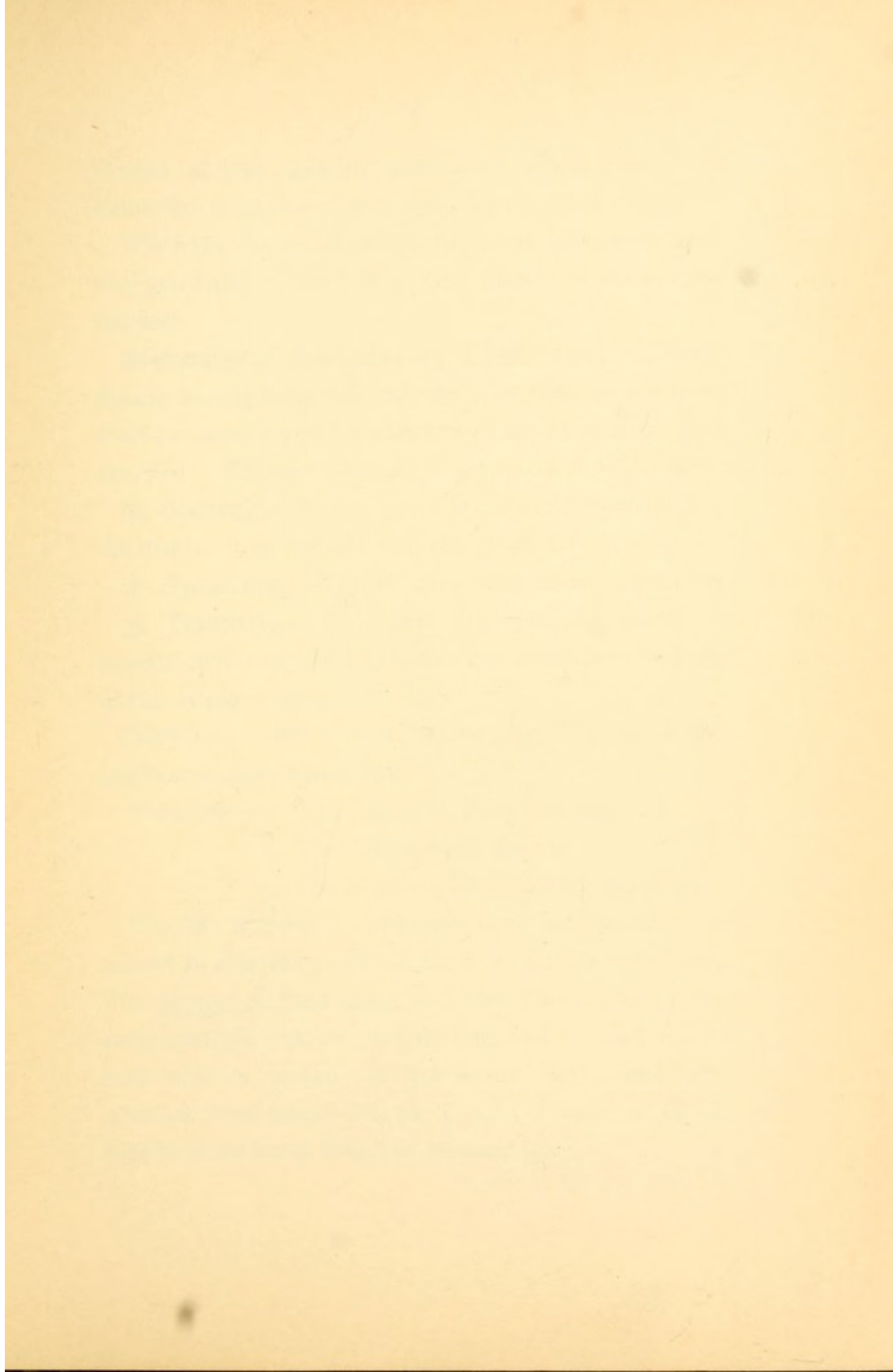
Forcible reduction of deformity under anæsthesia should be reserved for the more resistant cases. The patient having been anæsthetized, the deformity is slowly reduced, as much as possible by direct traction.†

This method is particularly applicable to hospital practice, and when properly performed, it is very satisfactory. In the very resistant cases the deformity may be reduced at several sittings. In some instances division of the contracted soft parts may be necessary, and in fixed de-

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(\*) Describe its details.

(†) What are the possible dangers of this procedure?





formity of long standing osteotomy of the femur, just below the trochanter minor, may be required.

When the distortion of the limb has been overcome, the extremity is fixed in a long plaster of Paris spica bandage.

**Mechanical Ambulatory Treatment.**—The deformity having been reduced, the joint must be protected from pressure, jar and motion, until the disease has been checked. Efficient mechanical treatment should assure :

- Rest* {
1. **Stilting.**—The removal of the foot on the side of the disease from contact with the ground.
  2. **Splinting.**—The mechanical fixation of the joint.
  3. **Traction.**—To relieve the muscular spasm, to prevent deformity, and to lessen the closeness of contact of the diseased parts.

From this point of view, one may criticize the various appliances in common use.

- These are—1. The plaster of Paris bandage.  
 2. The Thomas hip splint.  
 3. The Traction or American hip splint.

The first of these is commonly used in Germany, the second in England, and the third in the United States. The plaster of Paris spica and the Thomas hip splint assure simple fixation or splinting, and if used with a high sole or patten on the sound limb, and with crutches, they assure stilting, *i. e.*, the removal of the weight of the body from the diseased joint.



When properly applied the **plaster of Paris spica** is a very effective splint. Its disadvantages are that it becomes soiled if the attendants are careless, and that its application is somewhat difficult. It should fit the body and the limb closely, and it should extend from the toes to the lower angles of the scapulæ. The bony prominences should be protected by felt pads, and the limb and body should be enveloped in bandages of flannel or canton flannel, several layers being applied over the prominent points. The plaster bandage must be renewed at intervals of from one to three months. It is most useful as a temporary dressing.

**The Thomas hip splint\*** is a simple posterior splint made of soft iron, three-quarters of an inch wide, three-sixteenths of an inch in thickness, and long enough to reach from the lower angle of the scapula to the lower third of the leg. This band is bent at the buttock so that the leg portion is on a higher plane than the body part, but parallel to it. The splint is provided with a thoracic band of hoop iron, long enough to encircle three-quarters of the chest, one-third of the band on the side corresponding to the diseased hip, two-thirds on the other side. Thigh and leg bands ( $\frac{3}{4} \times \frac{1}{16}$ ) encircle, the one, two-thirds of the thigh an inch below the perineum, and the other the lower part of the calf.

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\* What are the advantages and disadvantages of the brace?

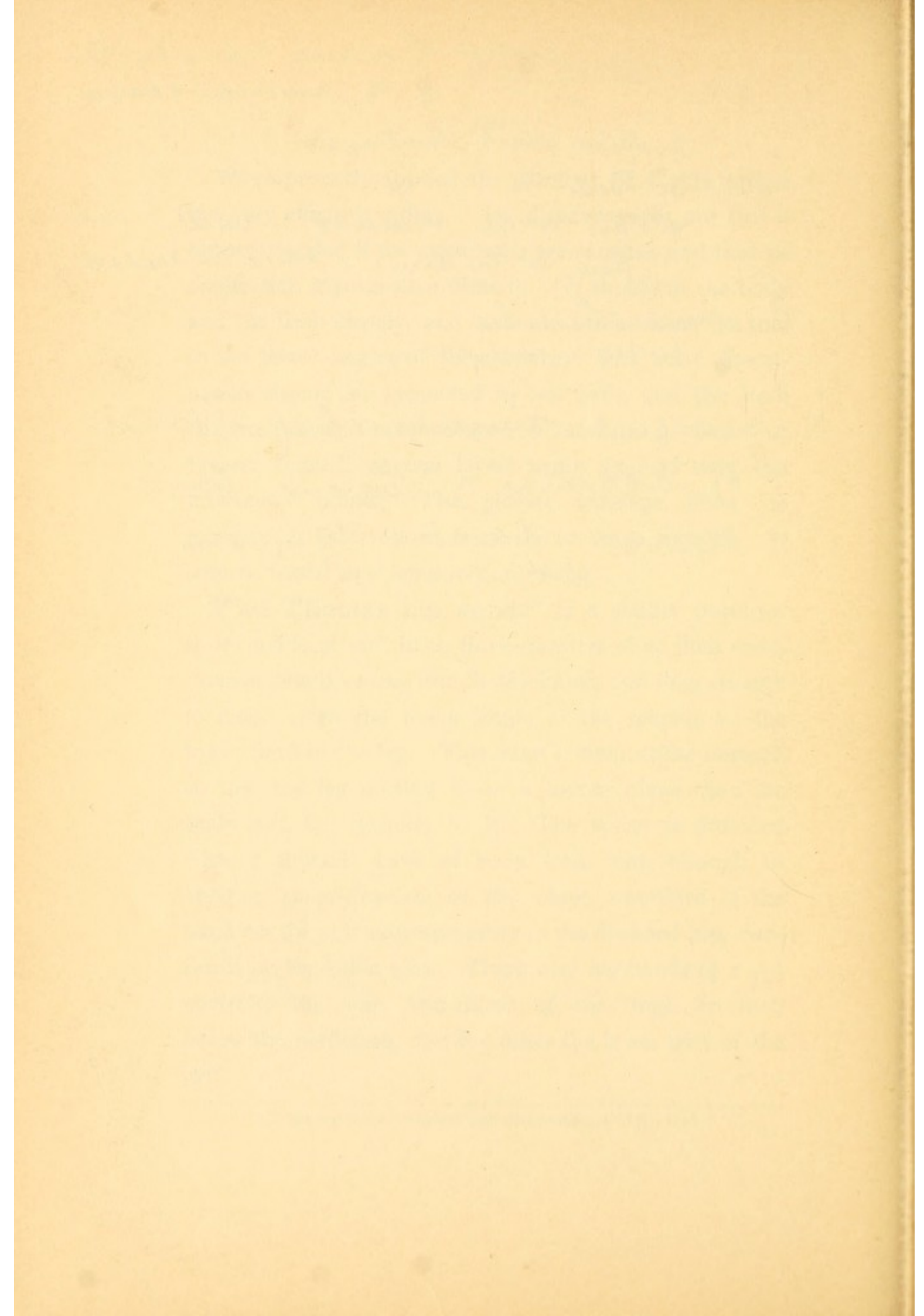
A.

1. anaesthetic to relieve deformity due to the muscular spasm.
2. Spica plaster bandage
3. Bed
4. Not to be removed until all pain + tenderness have subsided.

B.

1. narrow band bed
2. pulley + weight

C. Modified American hip splint  
by addition of thoracic band.  
Kept on about 3 years.



The splint may be used also to reduce flexion. For this purpose it is bent to the line of deformity and attached to the limb; then from time to time it is straightened a few degrees by means of wrenches, the patient meanwhile resting in bed.

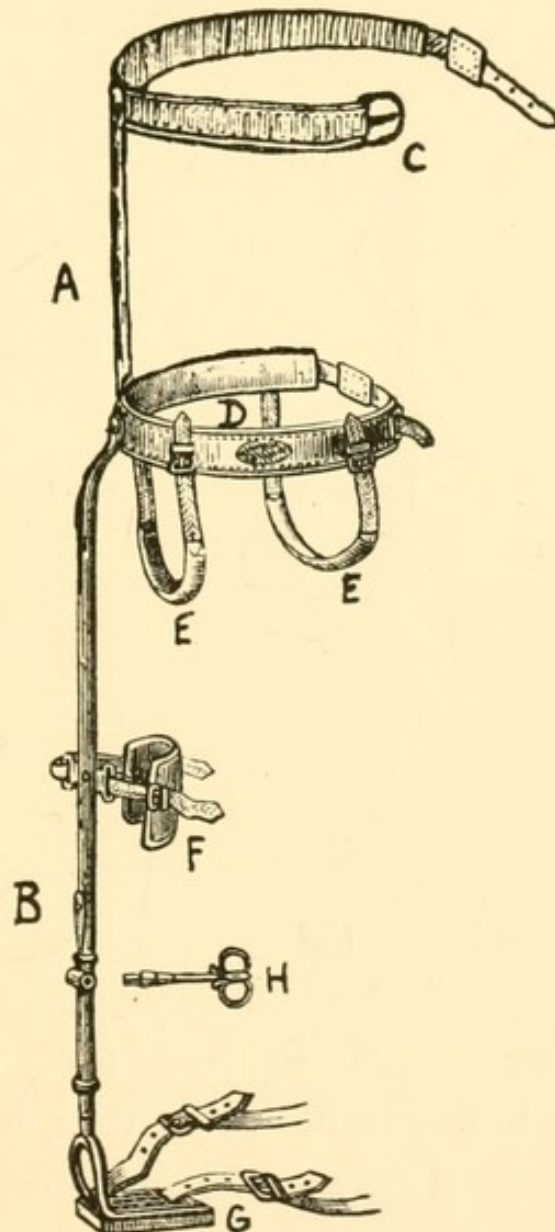


FIG. 28.—*American Hip Splint* (B) with the Addition of Rod (A), making it the *Long Hip Splint*; (C), thoracic band; (D), pelvic band; (E E), pelvic straps; (F), knee band. (G), foot plate; (H), key.

The ordinary form of **American hip splint** (Davis, Taylor, Sayre) combines stilting and traction. It consists of a pelvic band of mild steel  $1\frac{1}{4} \times \frac{1}{8}$  inch, encircling two-thirds of the pelvis at a point midway between the trochanters and the crests of the ilium. A leg part

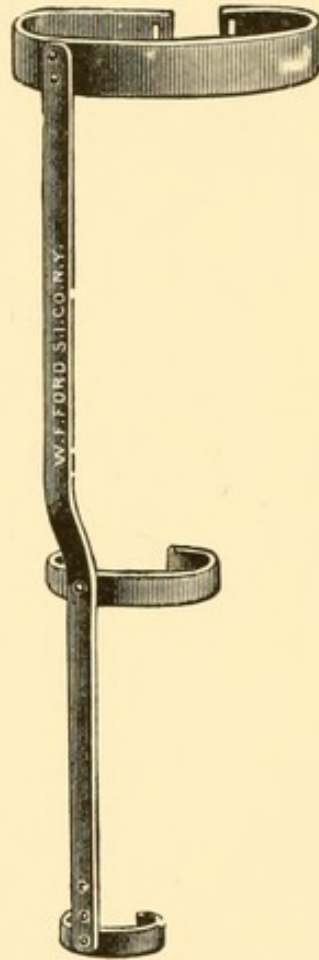
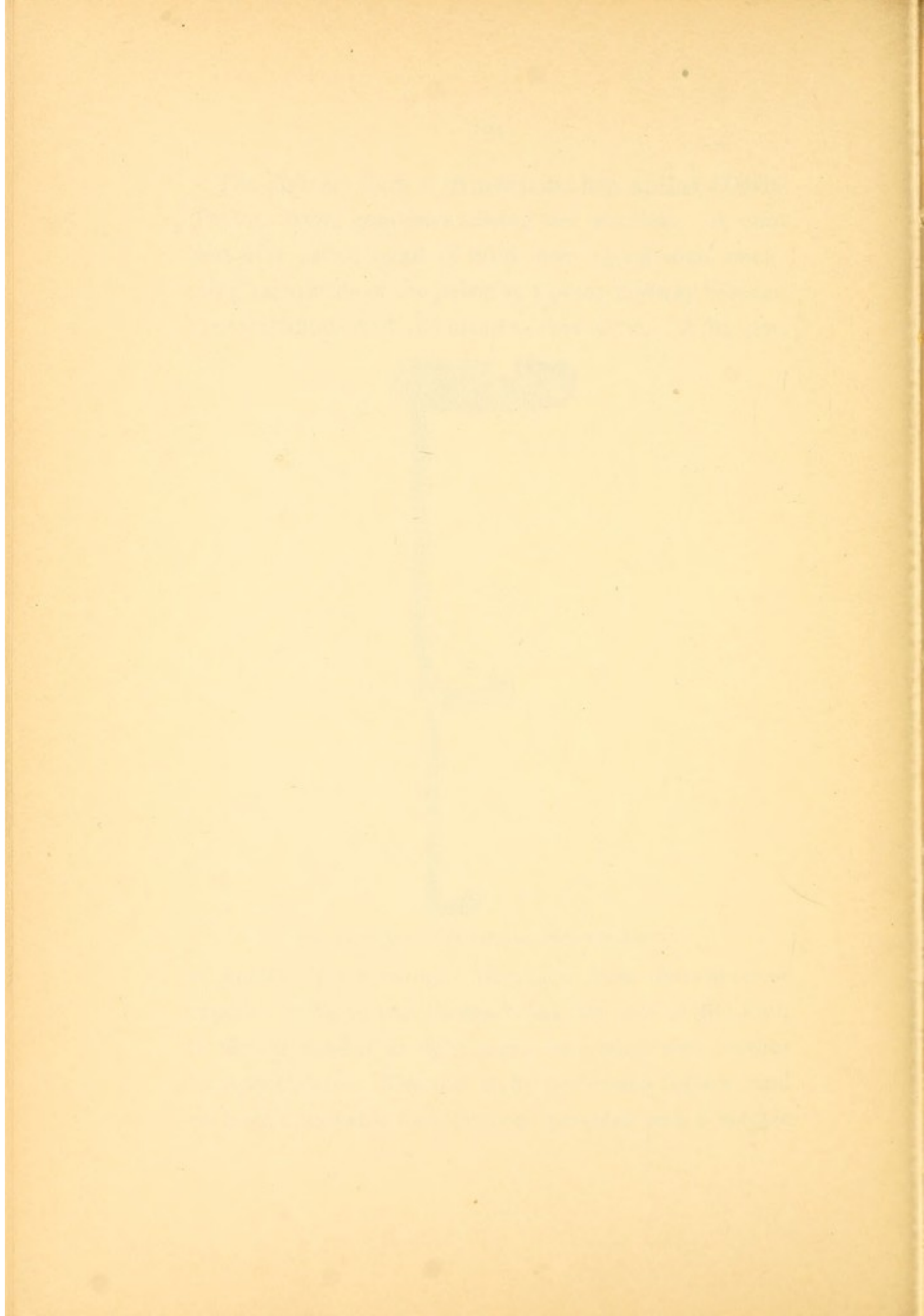
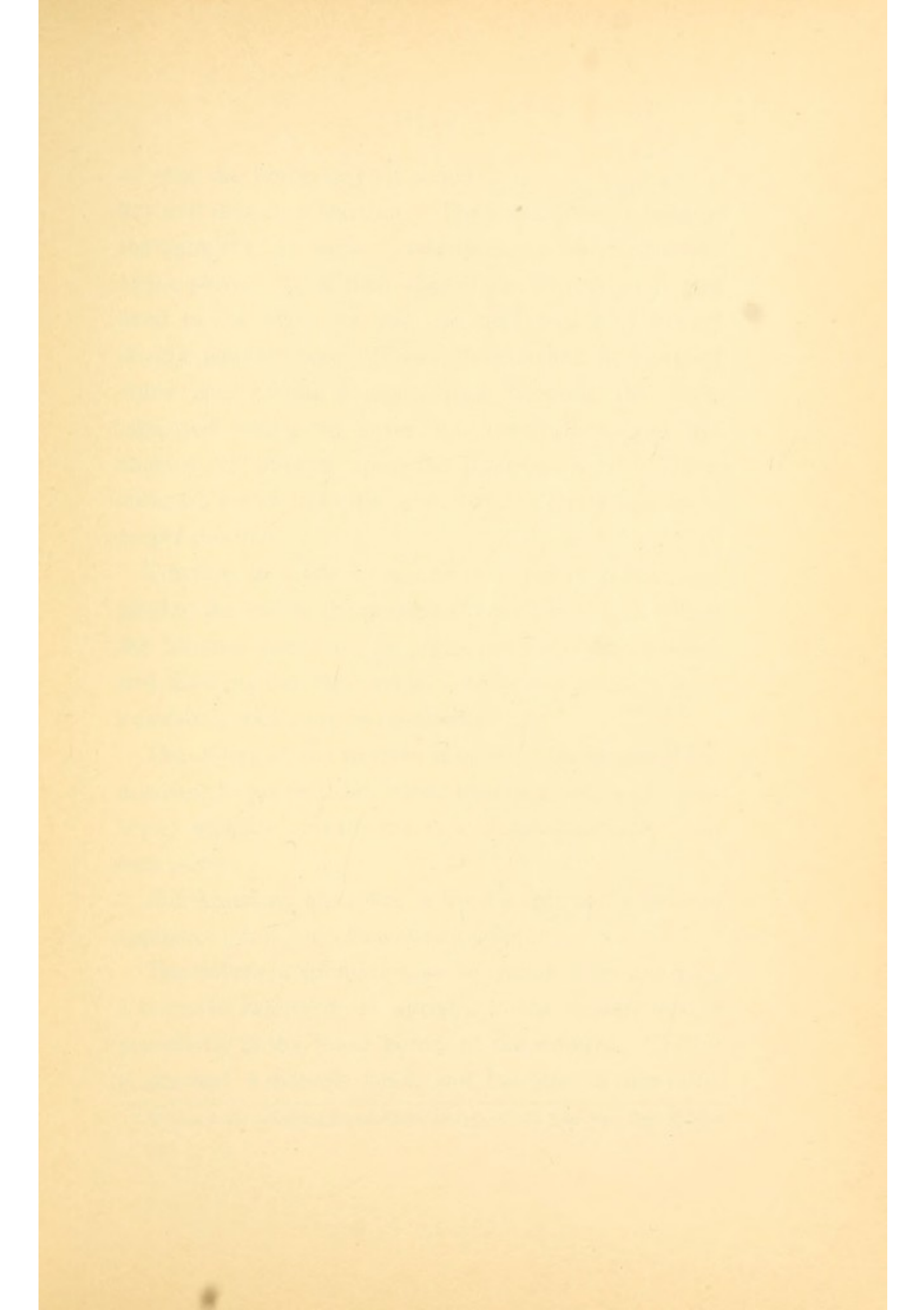


FIG. 29.—Thomas' Hip Splint (posterior aspect).

or upright, long enough to reach from the anterior superior spine to two inches below the sole of the foot, is turned inward at right angles and shod with leather for a foot piece. The rod is by preference hollow, and encloses a movable foot portion provided with a ratchet











so that the brace may be made longer by means of a key and thus exert traction. The pelvic band is fixed to the upright at an angle corresponding to the inclination of the pelvis. It is then shaped about the pelvis and fixed in its place by two perineal bands of strong, thickly padded tape. These are attached in front on either side of the genitals, pass between the legs, separated widely to cover the tuberosities, and are attached to buckles upon the posterior band. When these are drawn tight the pelvic band is firmly held in its proper position.

Traction is made by means of adhesive plaster, applied to the limb in the manner already described. When the traction straps are in place, the leg is drawn down and fixed by the foot straps. As much traction as is possible is then exerted constantly.

The object of the traction is to relax the spasm of the muscles, to prevent distortion, to secure rest, and possibly to separate actually the two diseased surfaces from each other.

The American hip splint is both a stilt and a traction appliance ; it is not efficient as a splint.\*

The failure in splinting may be remedied by applying a thoracic extension or upright, in the axillary line or posteriorly to the lower border of the scapula. To this is attached a thoracic band, and the joint is thus more

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\* What are the advantages and disadvantages of the American Hip Splint ?

efficiently supported. This long hip splint is more cumbersome, but more efficient than the short appliance. The two perineal bands may be replaced by a padded iron ring fitted to the upper extremity of the thigh, fixed to the upright at an angle corresponding to the inguinal fold.\* Such a brace will then correspond fairly to what is known as the Phelps brace. The ring is a better support than the perineal bands, but it is often less comfortable and less cleanly.

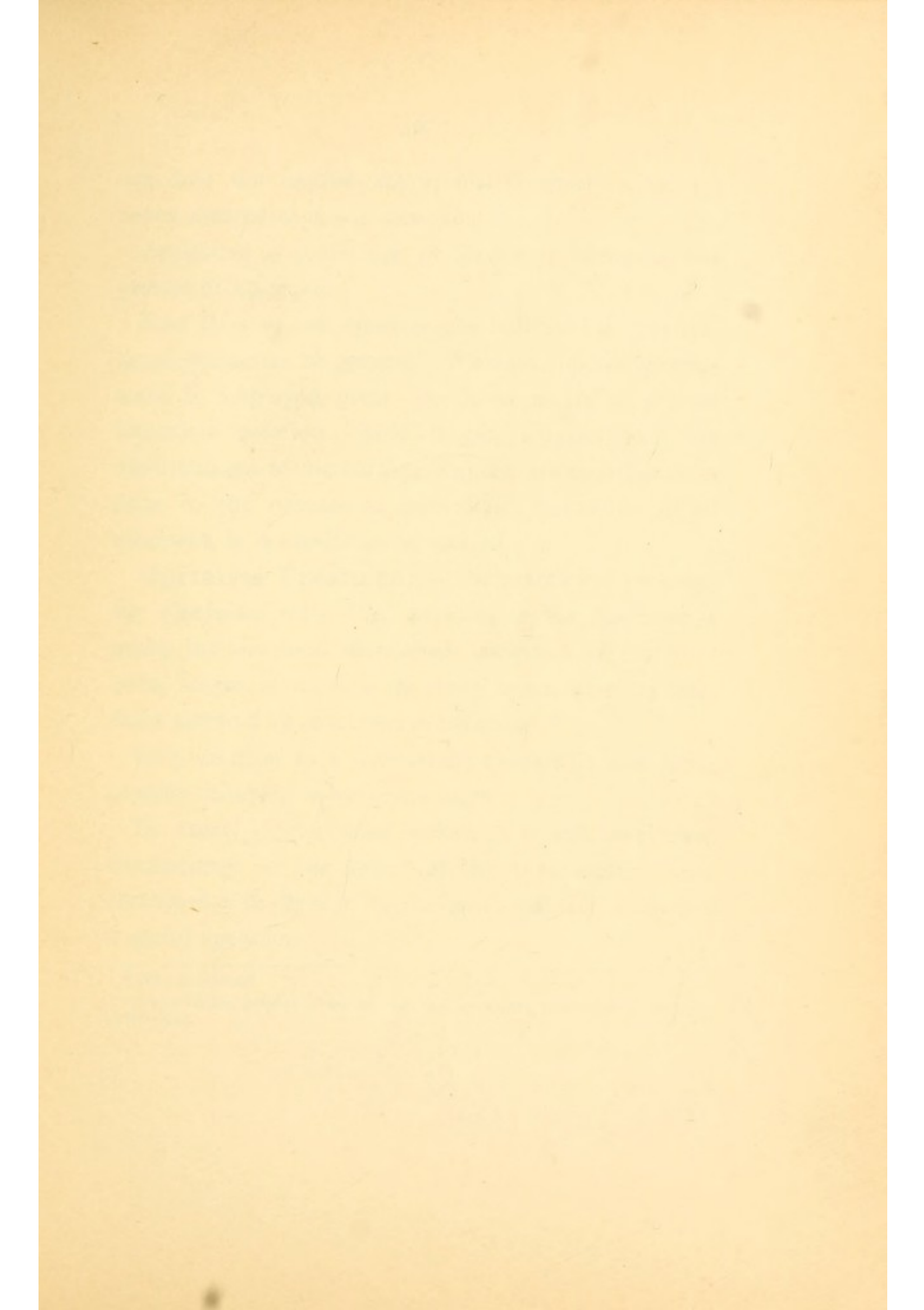
During the progressive stage of the disease, when pain is a prominent symptom, rest in bed is indicated, and crutches should be used in the ambulatory treatment in addition to the brace, as long as the intensity of the muscular spasm indicates that the disease is active.

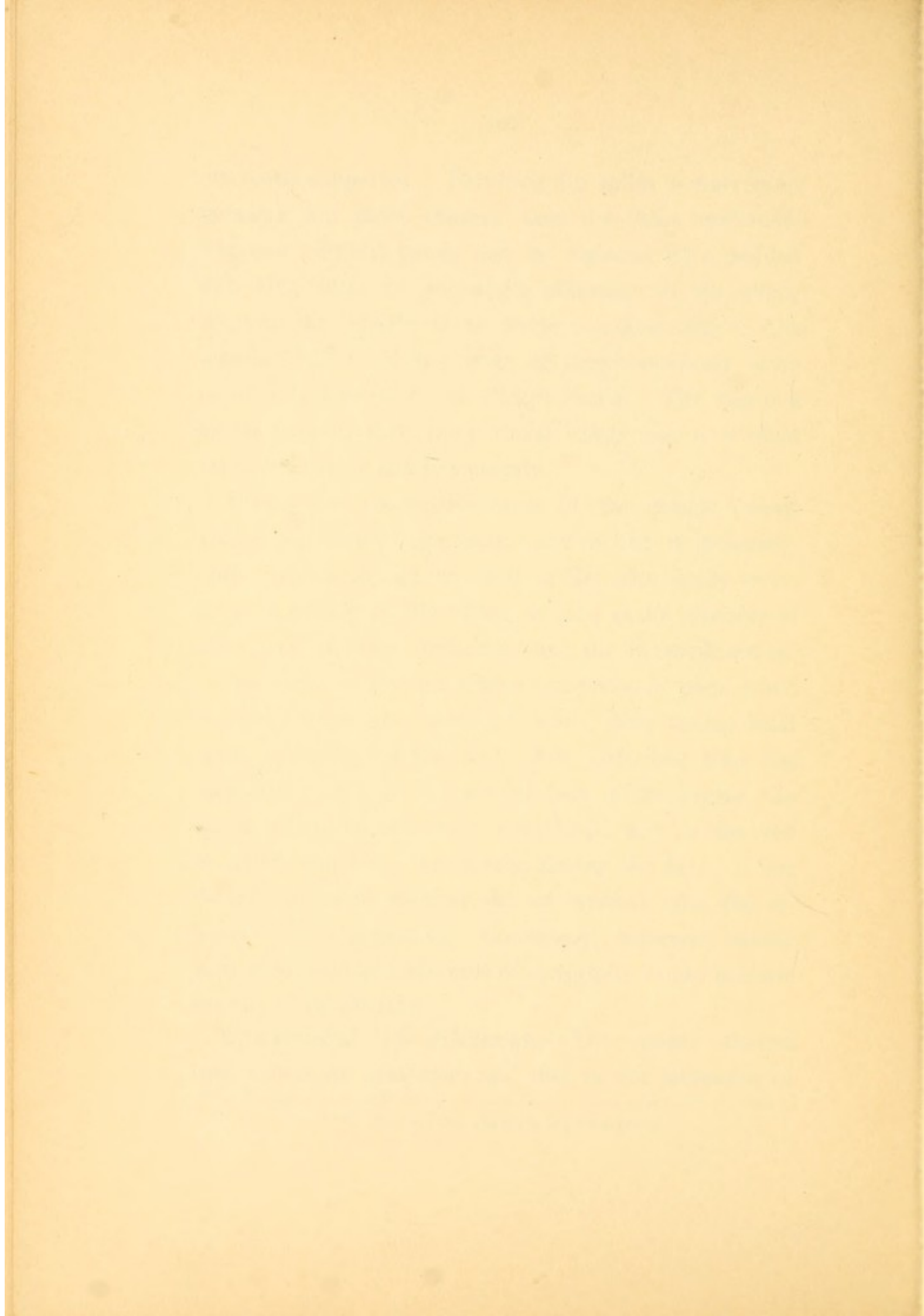
When the patient no longer complains of pain, when muscular spasm has subsided, when there are no local signs of active disease, and when sufficient time has elapsed to allow for the natural cure of the disease, the brace, which has been worn constantly, may be removed at night, and later, tentatively, during the day. If the disease is cured, motion should increase after the removal of the apparatus. Conversely, increased restriction of motion and increase of deformity would indicate activity of the disease.

**Treatment of Abscess.**—The simple abscess that causes no symptoms and that is not increasing in

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\* The Thomas ring shown in the knee brace.





size does not require any special treatment. Spontaneous absorption is not infrequent.

Aspiration is sometimes of service in hastening the process of absorption.

Free incision and drainage are indicated if constitutional symptoms be present. Whenever operative treatment is employed, great care is necessary to prevent secondary infection. This danger, together with the disadvantages of discharging sinuses, are contra-indications to the routine of immediate evacuation of all abscesses, as is sometimes advocated.

**Operative Treatment.**—The practice of performing **excision** early, *i. e.*, as soon as the diagnosis is made, has now been abandoned, inasmuch as the functional results of excision are much less satisfactory than those attained by conservative treatment.\*

Late excision as a life-saving measure is not infrequently indicated in neglected cases.

In cases of confirmed deformity † with ankylosis, **osteotomy** of the femur at the trochanter minor, combined with division of the most resistant tissues, is a useful operation.

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\* Why is this so?

† Describe the functional effects and the secondary symptoms of extreme deformity.

## 2. DISEASE OF THE KNEE JOINT.

SYNONYMS.—White swelling. Tumor albus.

DEFINITION.—A tuberculous disease of the knee joint, which usually begins in the epiphysis of the femur or of the tibia.\*

CAUSES AND PATHOLOGY.—The etiology and pathologic anatomy of knee disease are practically the same as in disease of the hip joint.

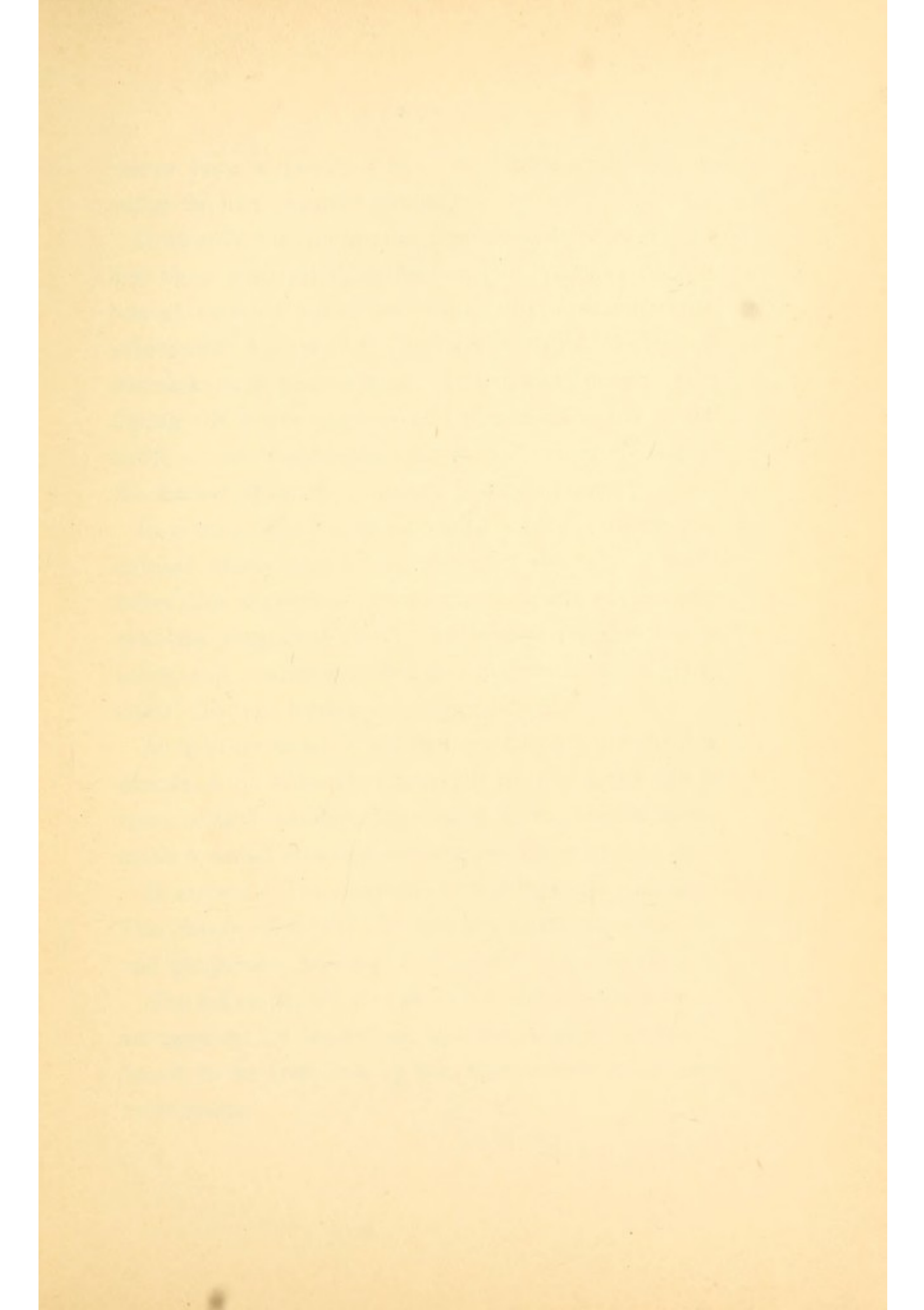
Disease of the knee joint, however, is a much less serious affection than hip disease, and it is much more amenable to treatment. In those cases that have received constant and efficient protection, recovery without deformity and with a fair range of motion may be predicted.

SYMPTOMS.—The symptoms are similar in character to those of hip disease, except that the pain is localized at the seat of disease, and that local swelling and local sensitiveness are usually more apparent, owing to the fact that the affected parts are more superficial than in the latter instance.

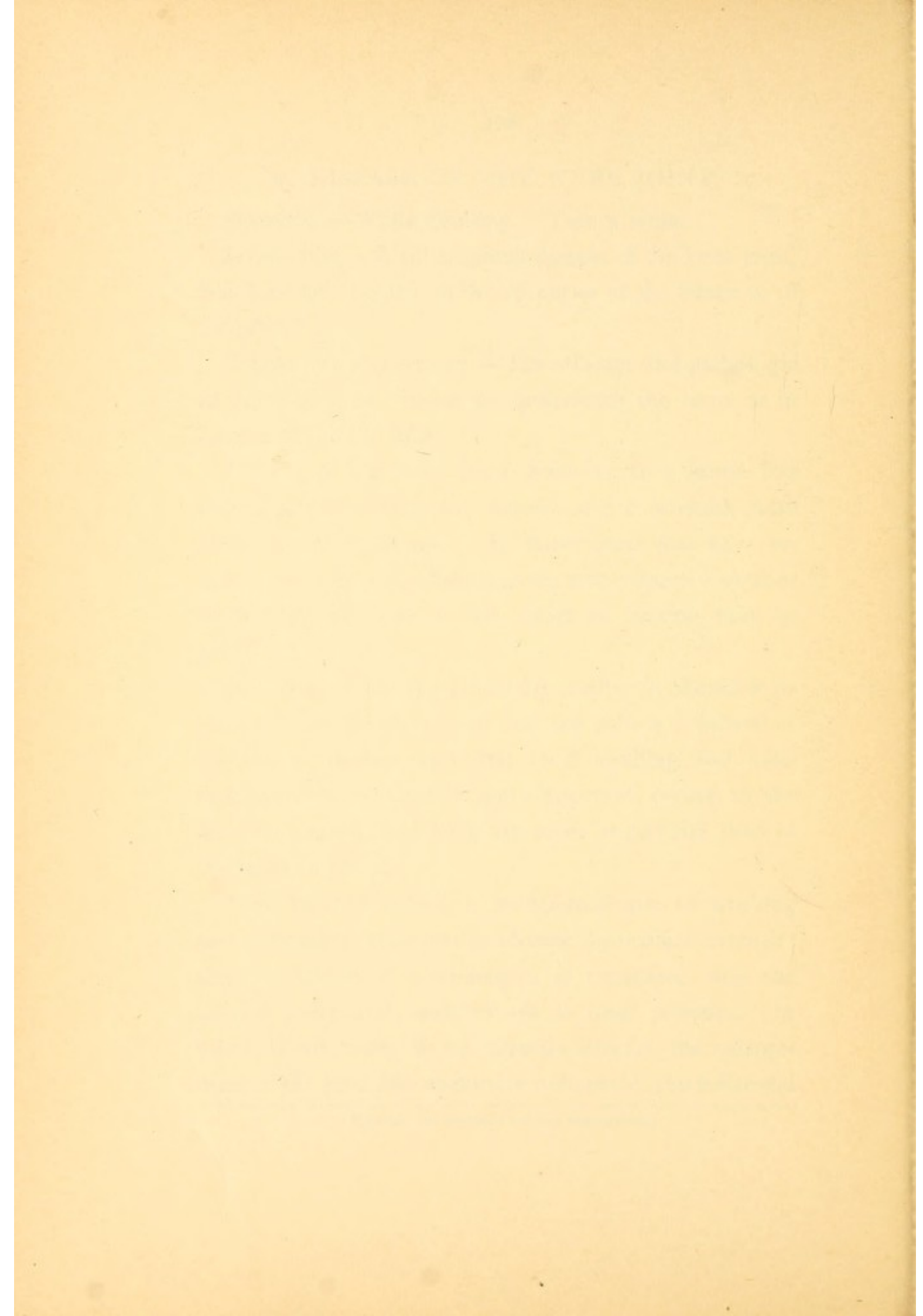
Thus there is usually a moderate degree of swelling and infiltration, sufficient to change the normal contour; slight elevation of temperature as compared with the normal joint, and sensitiveness to deep pressure. In more chronic cases, as the muscles atrophy, the enlargement of the joint becomes more noticeable, the infiltrated

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\* Explain the causes of these deformities.







tissues have a peculiar white or bluish white color ; hence the name **tumor albus**.

Gradually the deformities appear and increase. At first there is simply slight flexion, but later the tibia is rotated outward upon the femur, and it may become subluxated backward.\* Usually a slight degree of knock-knee is present also. Actual shortening is rare during the active stage of the disease. On the other hand, actual lengthening, due to the irritative effect of the disease upon the epiphyses, is often observed.

In certain cases, more especially in older subjects, the clinical characteristics are those of synovial disease rather than of osteitis. This form of chronic tuberculous synovitis progresses slowly ; all the symptoms are sub-acute, and contractions are long deferred. Koenig has called this type **hydrops tuberculosus**.

As in other forms of tuberculous disease, the onset of disease at the knee joint is usually insidious, the symptoms being discomfort, aggravated by unguarded movements to actual pain, and stiffness, with the attendant limp.

**DIAGNOSIS.**—The diagnosis is usually made with ease. The history often indicates that the affection is chronic and progressive, and that it is located in one joint.

The deformity, the change in contour and the atrophy are apparent on inspection, and the range of motion is found to be restricted by the characteristic reflex muscular spasm.

The symptoms and appearances in the very early cases are often supposed to be due to **injury**, but the effects of traumatism quickly disappear when the joint is placed at rest, while in tuberculous disease the symptoms simply become quiescent. Thus in all doubtful cases a plaster bandage should be applied, and the patient should be kept under observation until a positive diagnosis can be made.

Tuberculous synovitis in older subjects resembles somewhat the **simple effusion** that may be the result of injury or of rheumatism ; but the subsequent behavior of the joint under treatment will make the diagnosis clear.

**Sarcoma** of the femur or of the tibia at the knee joint resembles tuberculous disease closely, except that the enlargement is more often irregular, not involving the entire joint, and that its progress is more rapid.

**TREATMENT.**—The principles of treatment of tuberculous disease have already been outlined.

The deformity must be overcome, the joint must be fixed in the extended attitude, and the weight of the body must be removed.

The deformity may be reduced :—

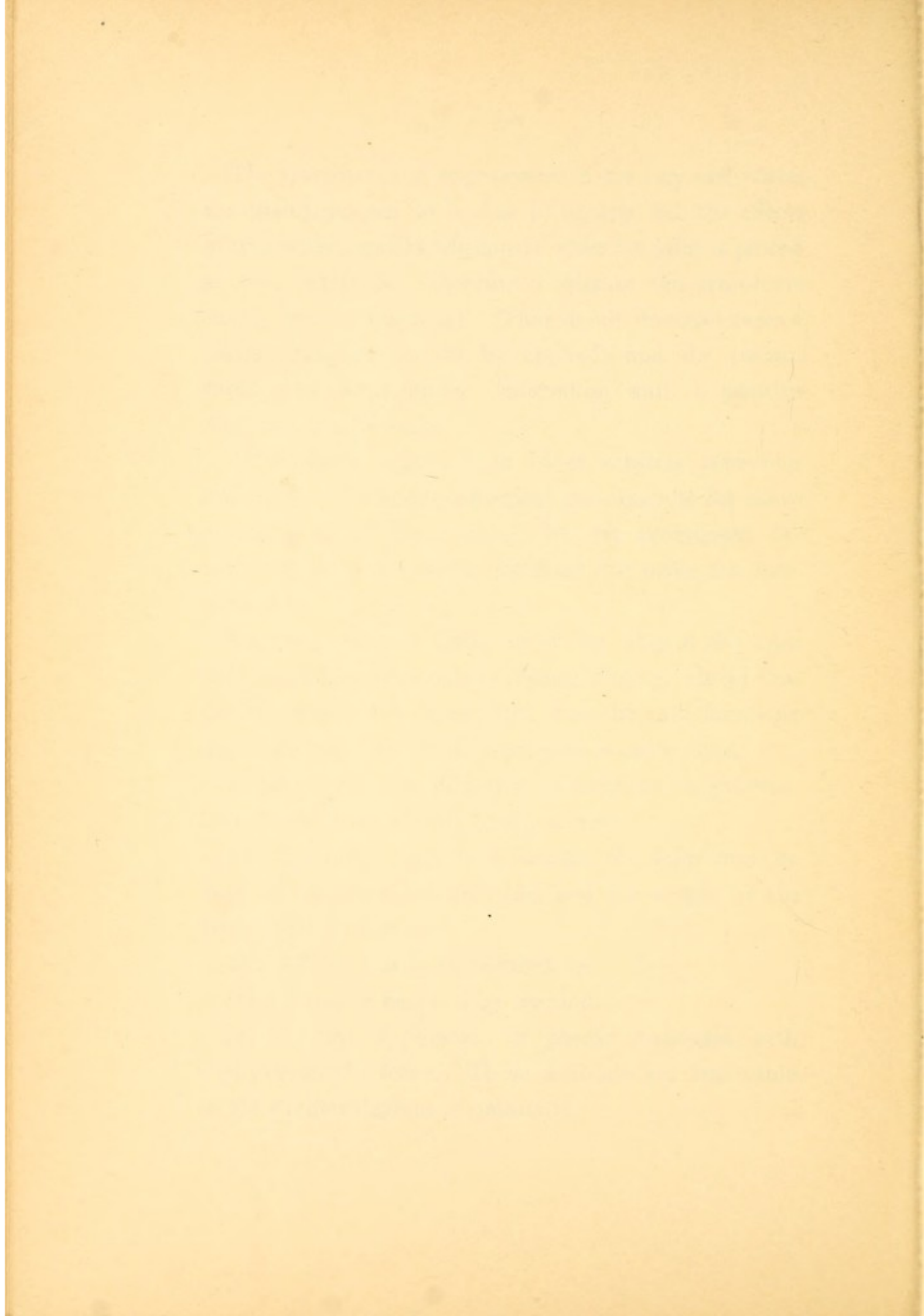
(1) By rest in bed and by traction.

(2) By the application of plaster bandages with slight corrective force. These methods are applicable to the slighter degrees of deformity.

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(3) By means of the jointed Billroth plaster splint applied in the line of deformity and very gradually extended at intervals.

(4) By manipulation under anæsthesia, the limb being slowly straightened, in great part by traction.

(5) In resistant cases division of the contracted tissues may be necessary, and osteotomy is not infrequently

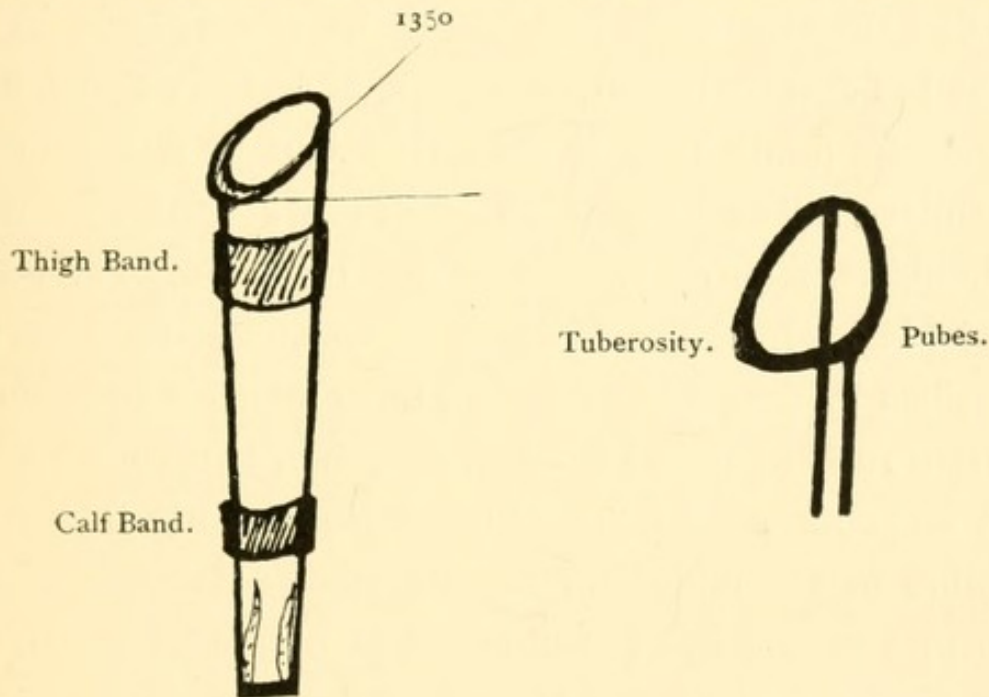


FIG. 30.—*The Thomas Knee Splint*, (Material: Iron wire  $\frac{1}{8}$  to  $\frac{3}{8}$  inch in diameter.)

required when the deformity is of long standing after the disease is cured.

When the deformity has been reduced, a brace must be applied to hold the limb in the normal position and to protect it until cure is established.

One of the most useful appliances is the **Thomas knee brace**.

This consists of an iron ring, so shaped as to fit the upper extremity of the thigh closely, supported on two lateral bars at an angle corresponding to the inguinal fold. This ring is padded with felting and covered with leather. It rests upon the ramus and the tuberosity of the ischium and thus supports the weight of the body. The lateral uprights are joined about two to four inches below the sole of the foot. The leg is supported by a band of leather beneath the thigh, and the calf and the knee are firmly fixed to the lateral bars by means of a bandage. The brace is suspended by a band over the shoulders, after the manner of the attachment of an artificial leg. In ordinary practice extension on the joint is applied by means of adhesive plaster attached to leather straps running from the foot piece, and, if the disease is at all acute, a light plaster bandage extending from the pubes to the middle of the leg is of advantage, as it insures more perfect fixation. A high shoe or patten is worn on the opposite side.

**Operative Treatment.**—Operative intervention is not often indicated in the treatment of the disease in childhood. Abscess, if it cause symptoms or is of some size, may be incised and drained if asepsis can be assured. Arthrorectomy may be required in exceptional cases. As a rule, this operation is followed by ankylosis, and in all cases of ankylosis support is required for an indefinite time to prevent deformity.\*

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\* Why is this the case?







Excision should never be performed in early childhood. It is often indicated at an early stage in the adolescent or adult cases.\*

In the type of disease in which synovial effusion is the prominent symptom, incision and irrigation with anti-septic solutions with subsequent closure of the wound may be of service.

Occasionally the epiphyseal focus is circumscribed, and is situated near the surface, so that it may be removed before the joint is involved.†

The duration of the disease is three or four years. Supervision for a long time after the apparent cure is necessary.‡

### 3. DISEASE OF THE ANKLE JOINT.

This is far less common than disease of the hip or knee. Its etiology, pathology and clinical characteristics are identical with those of disease at the knee.

It is a chronic disability which causes discomfort, pain, stiffness, and a limp.

On examination the change in the normal outlines, the sensitiveness to pressure, the limitation of motion, and the muscular spasm characteristic of tuberculous disease are usually evident.

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\* Explain the reasons for this statement ?

† What is meant by Bier's treatment ?

‡ Whitman, *Archives of Pediatrics*, May, 1892.

The attitude is most often slight plantar flexion and slight abduction.

The affection is most often mistaken for rheumatism, chronic sprain, or flat foot.

**Treatment.**—The foot should be fixed by a plaster bandage in the median line at a right angle with the leg. The Thomas knee splint is an efficient appliance. It may be removed at night.

In childhood the **prognosis** as to final recovery with fair function† and but slight disability is very good.\* It is dubious in the adult cases, and amputations may be indicated if the disease is extensive.

Disease of the tarsus is treated in the same manner as that at the ankle joint, except that operative intervention is indicated if the focus is localized.‡

#### 4. DISEASE OF THE SHOULDER JOINT.

Tuberculous disease of the joints of the upper extremity are uncommon in childhood.§ Their characteristics are, of course, similar to those of disease of the joints of the lower extremities, and need not be mentioned again.

Disease at the shoulder joint is particularly insidious

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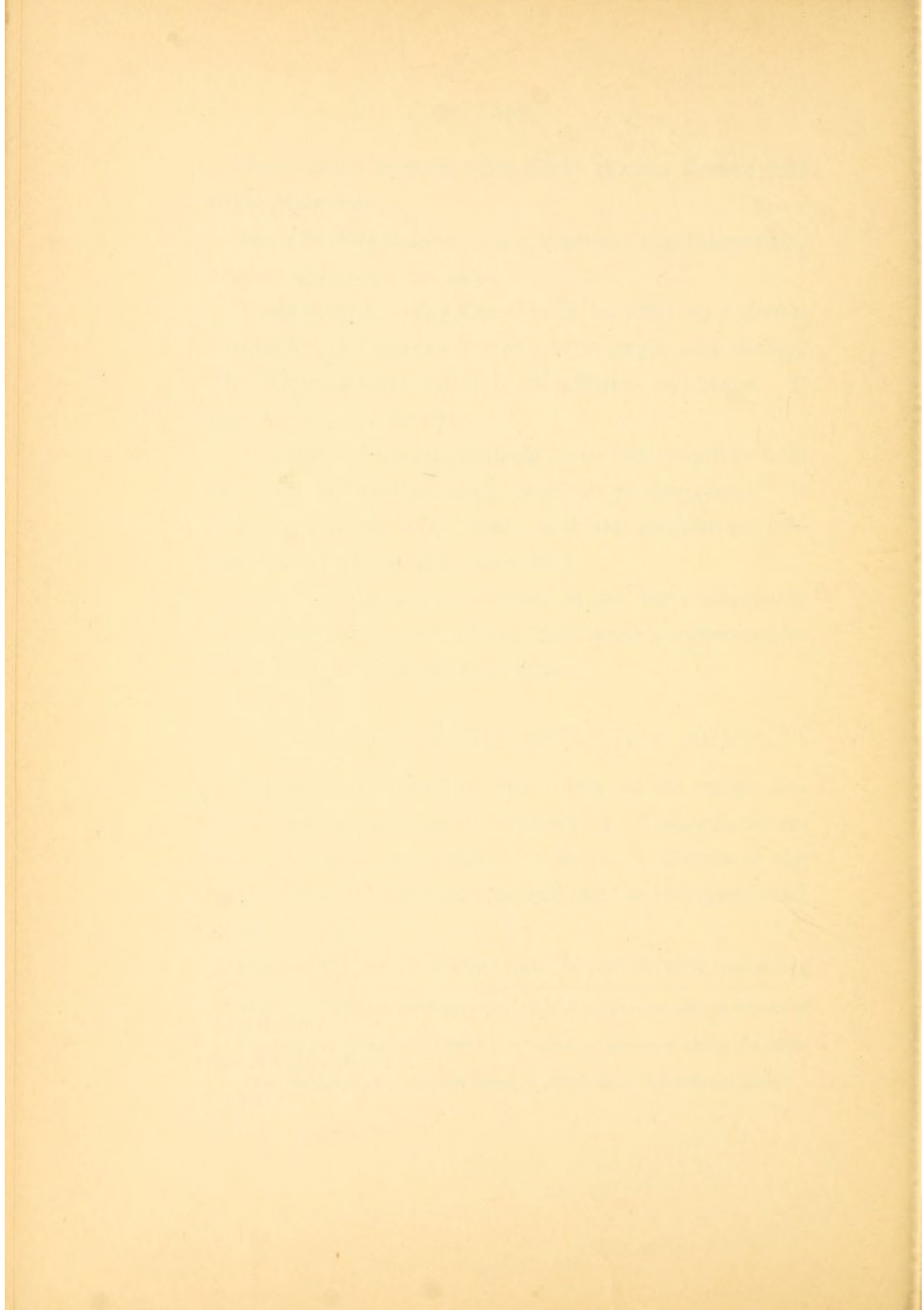
\* The danger to life is greatest in disease of the spine and least in disease of the ankle. Why?

† The final results as to function are better at the knee and at the ankle than at the hip. Why?

‡ What are the relative disadvantages of ankylosis at the different joints?

§ Why?





in its onset, and the restriction of motion may go on to practical ankylosis before the patient is aware of the disability. This peculiarity is explained by the free motion of the scapula upon the chest. Hence, in testing for restriction of motion the scapula should be fixed by the hand of the examiner.

The characteristic deformity is slight flexion and slight abduction upon the scapula. The atrophy of the shoulder muscles is often extreme, as compared to those of the arm.

**Treatment.**—A well-fitting shoulder cap of plaster of Paris or other material may be applied, and if the disease be at all acute, the arm should be fixed to the body.

In the treatment of children the arm should be fixed to the chest within the clothing.

## 5. DISEASE OF THE ELBOW JOINT.

In disease of the elbow joint the attitude is one of semiflexion, and the forearm is held midway between pronation and supination.

**Treatment.**—The arm should be fixed by a light plaster bandage in an attitude of about ten degrees less than a right angle. The hand should be supported by a sling.

The Thomas method of treatment consists in fixing

the joint at a more acute angle by holding the hand in close contact with the neck by means of a bandage. This method is also effective.\*

In the treatment of young children the arm should be placed within the clothing.

## 6. DISEASE OF THE WRIST JOINT.

The deformity consists of flexion of the hand upon the arm.

**Treatment.**—The part should be fixed in a plaster of Paris bandage in an attitude of slight dorsal flexion, in order that the grasp of the fingers may be retained if ankylosis results.

Disease of the joints of the upper extremity are relatively more common in adult life and they are very frequently complications of phthisis. Consequently the prognosis is far less favorable than in childhood.†

Excision of the joints, by which motion may be preserved, is more often indicated than in disease of the lower extremity because strength is of less importance than motion.‡

The duration of the disease in the upper extremity is shorter and the treatment is more simple.§

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\* Describe Thomas' method of involuntary reduction of deformity by means of the sling?

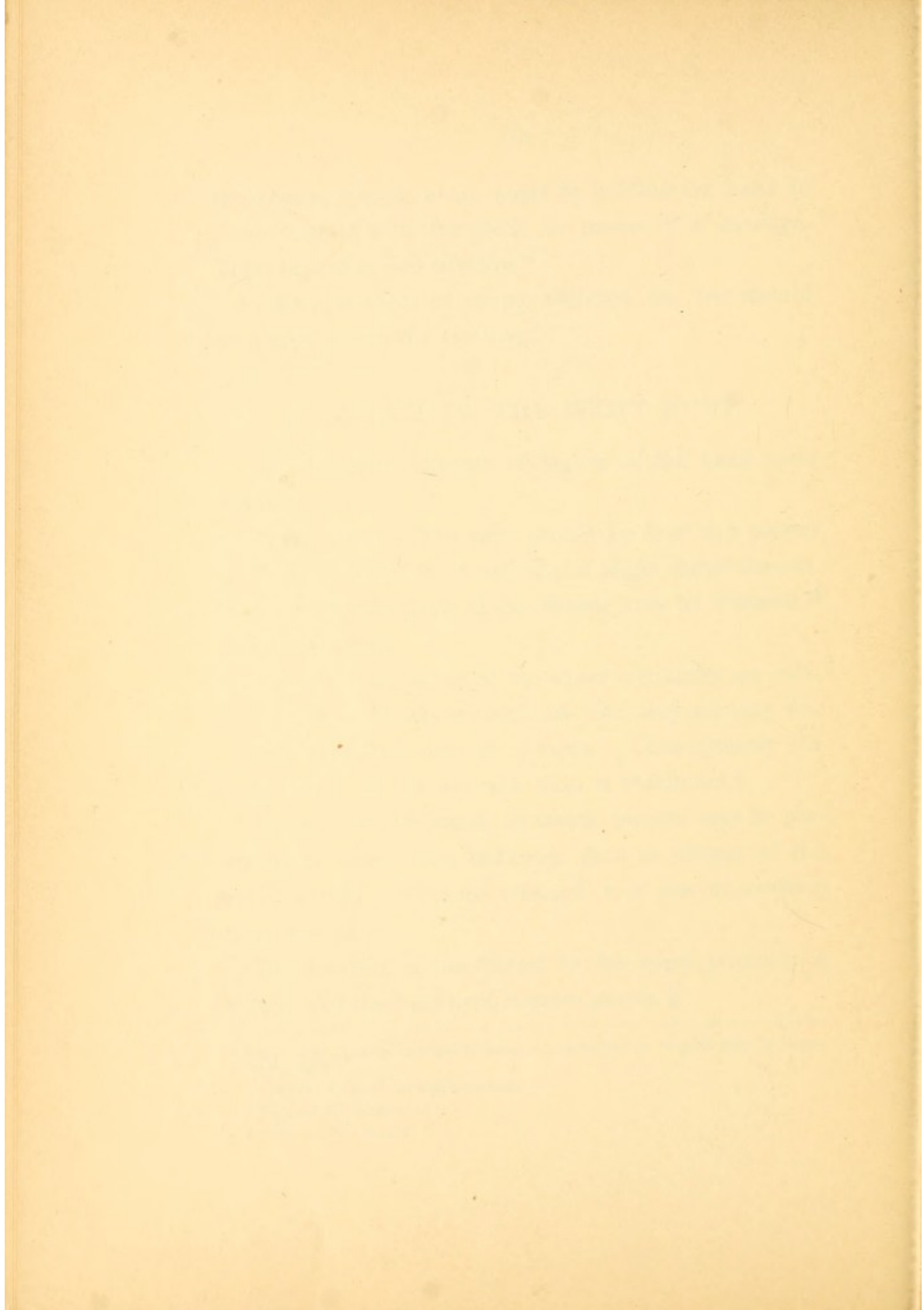
† Give the reasons for this statement?

‡ Explain this statement?

§ Why is this the case?







## 7. DISEASE OF THE SACRO-ILIAC JOINT.

SYNONYMS.—Sacro-iliac disease. Sacro-Coxitis.

ETIOLOGY.—Sacro-iliac disease is very uncommon in childhood, and in fact is rarely met with at any age when compared to disease of the spine or the hip joint.

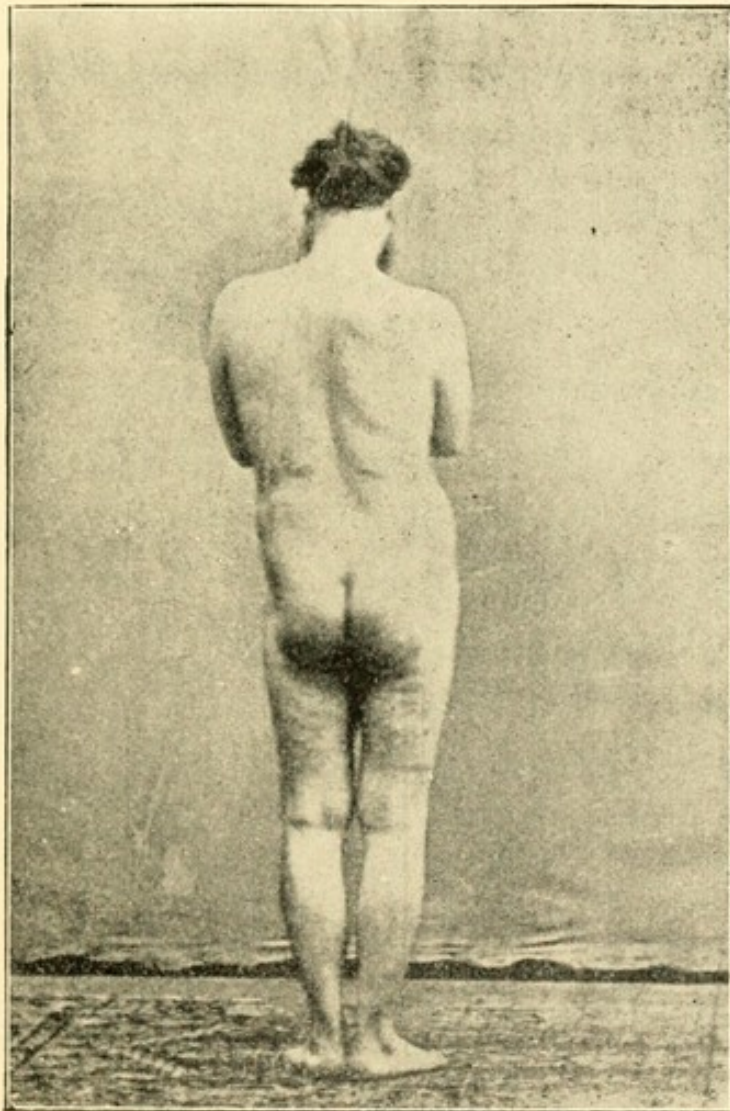


FIG. 31.—Sacro-iliac Disease. (R. H. Sayre.)

SYMPTOMS.—It is characterized by local pain at the articulation, increased by jars, or by lateral pressure on the pelvis. The branches of the sacral plexus may be involved, and referred pain similar to sciatica is also a frequent symptom. In order to guard the sensitive part, the patient habitually bears the weight upon the opposite leg. Thus there is usually an apparent lengthening of the limb on the affected side due to a tilting downward of the pelvis and a corresponding lateral deviation of the body in the opposite direction. At a later stage abscess may be present, and may form a tumor on the exterior aspect of the joint or within the pelvis. The patient walks with a peculiar limp, dragging or swinging the abducted and extended limb.

PROGNOSIS.—The prognosis is grave because of the age of the patients, and because of the danger of intrapelvic abscess.

DIAGNOSIS.—The diagnosis is based upon the peculiar attitude, the pain referred to the sacro-iliac articulation on lateral pressure, and the presence of local sensitiveness or abscess-formation. The affection must be differentiated from—

1. Hip disease.
2. Disease of the iliac bone accompanied by an abscess.
3. Sciatica.

In hip disease the limp and the attitude of the limb





are quite different, and the movements of the joint are checked by muscular spasm. Lateral pressure is not painful unless the acetabulum is primarily involved.

Iliac disease is as a rule practically painless, the abscess being the symptom that first attracts attention.

Sciatica may cause almost an identical attitude, except that the limb is usually somewhat flexed, and there is often lessening of the lumbar lordosis owing to a forward inclination of the body.

The affected nerve is also sensitive to pressure. Sciatica, with its attendant deformity, is more often mistaken for disease of the lumbar spine than for disease at this joint.

TREATMENT.—In the milder cases a well-fitting pelvic belt or plaster spica, including the pelvis and the thigh, usually relieves the symptoms. In addition, crutches should be used. If abscess be present, operative removal of the diseased part, with drainage, is advisable.

## IV. DEFORMITIES OF THE SPINE AND THORAX.

1. Torticollis. 2. Scoliosis. 3. Postural Deformities. 4. Deformities of the Chest.

### I. TORTICOLLIS—(WRY NECK).

**DEFINITION.**—Torticollis is a lateral deviation or twist of the head, caused usually by contraction or shortening of one or more of the muscles of the neck. The sternomastoid alone, or in combination with the trapezius muscle, is most often involved; consequently, in typical torticollis the head is tilted toward the contracted muscle, while the chin is slightly elevated and turned in the opposite direction.\*

**ETIOLOGY AND SYMPTOMS.**—Torticollis may be divided primarily into two classes: (*a*) Congenital, (*b*) Acquired.

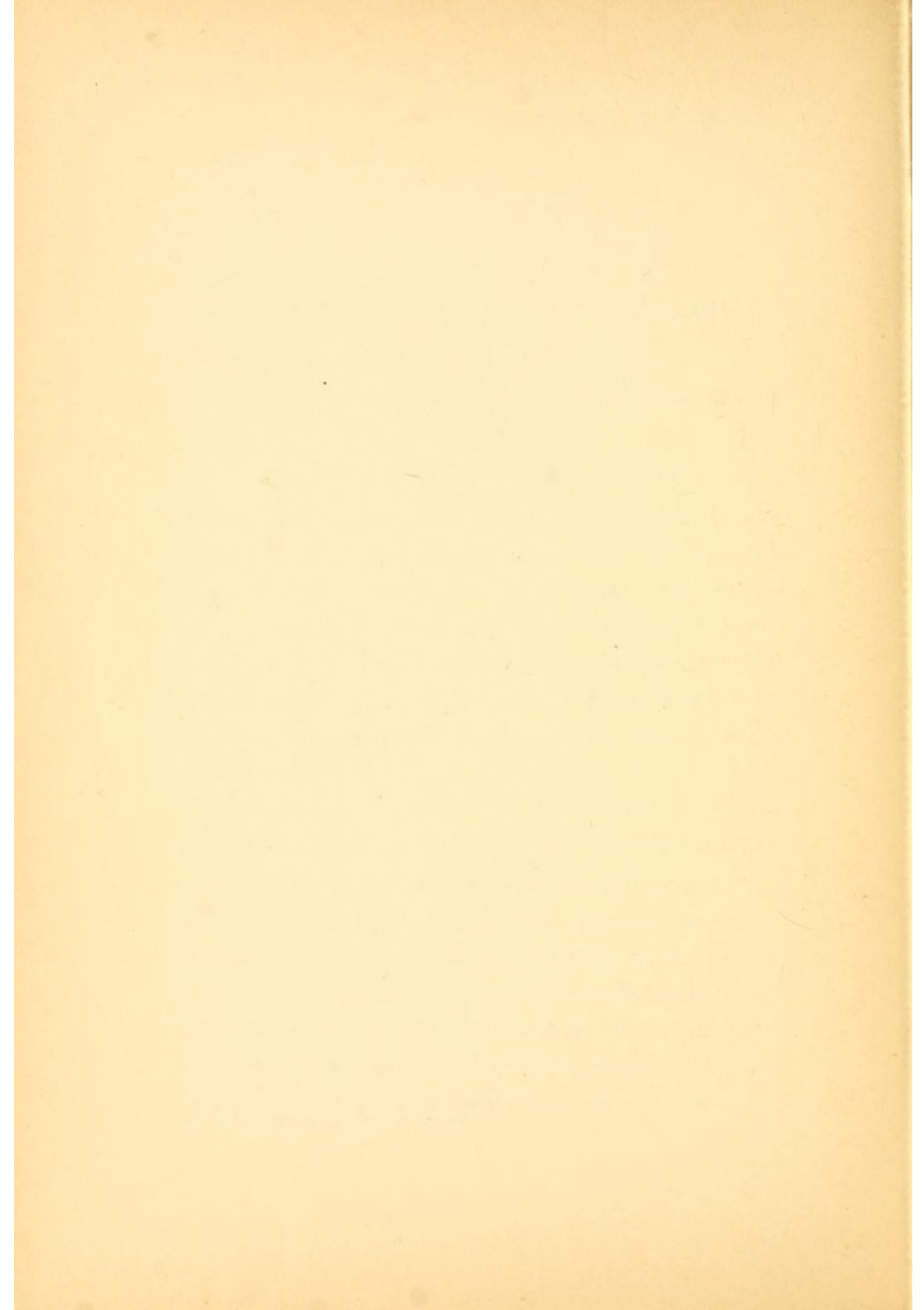
**Congenital torticollis** is comparatively rare. Its cause is apparently a constrained position in utero. It is consequently a painless shortening of the tissues. Not infrequently it is accompanied by slight hemi-atrophy of the face, or by distortion of the skull. In rare instances so-called congenital torticollis may be caused by injury at

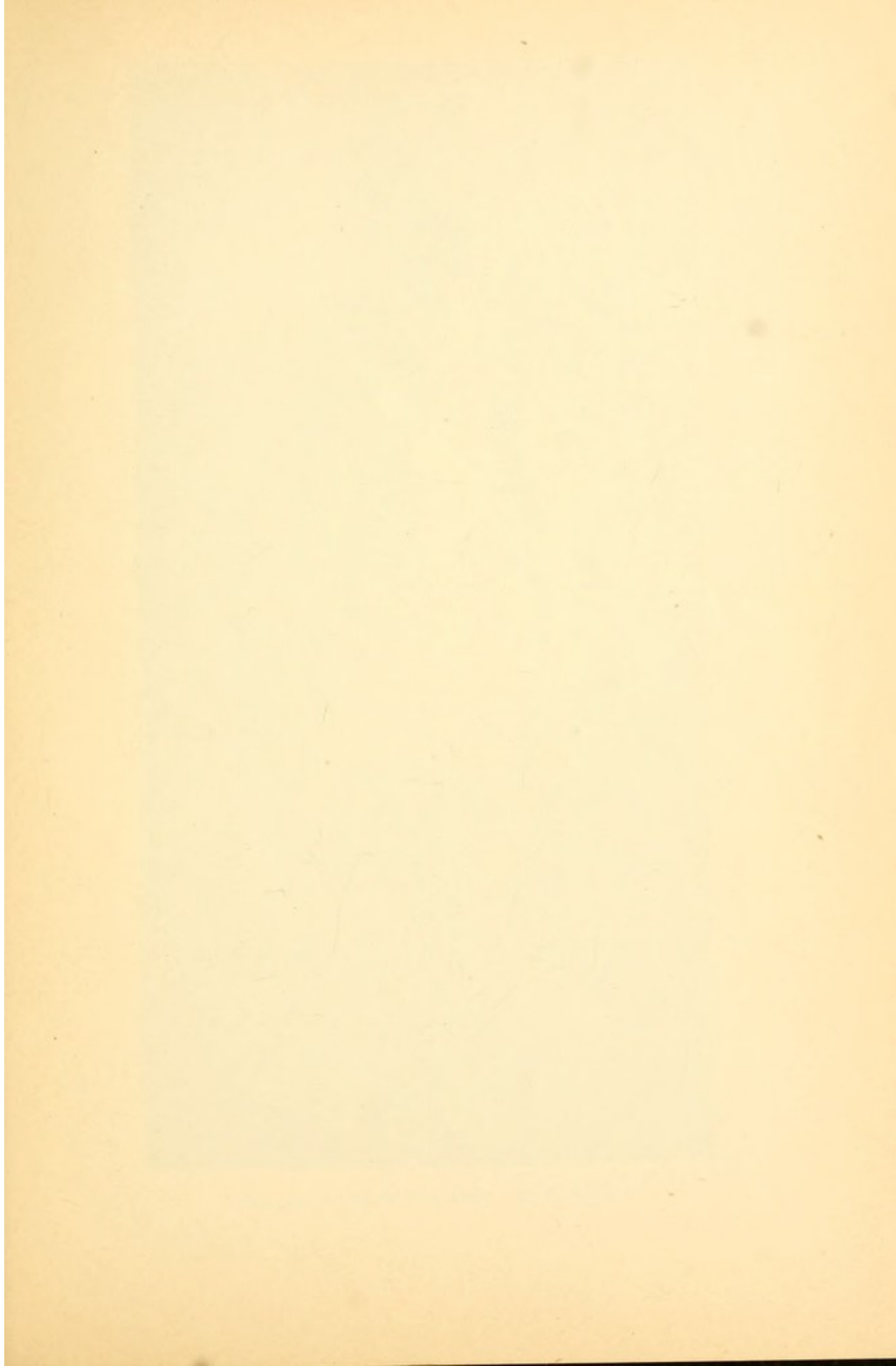
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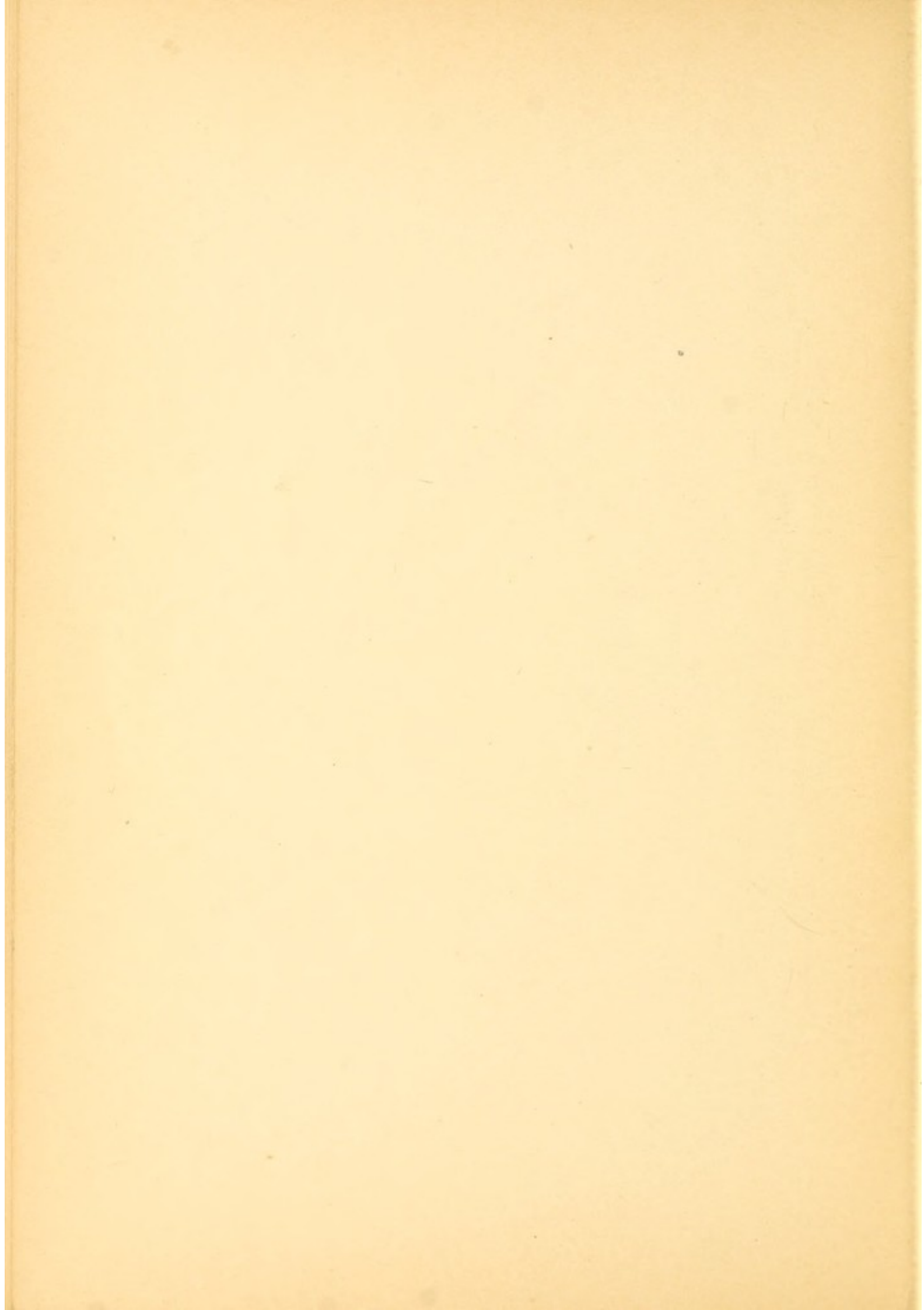
\*Describe other distortions. Describe the secondary or compensatory deformities following persistent torticollis.











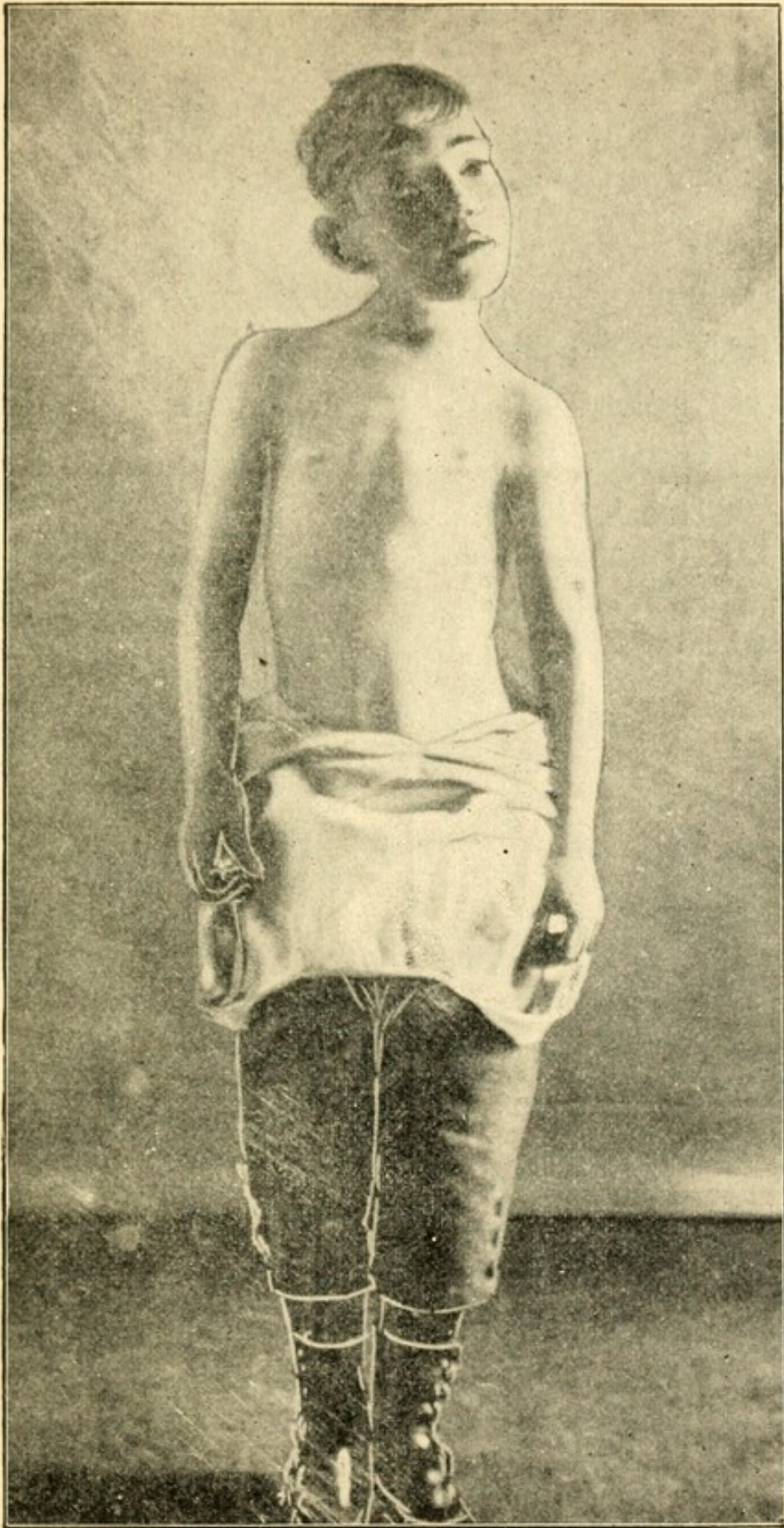


FIG. 32.—A Case of Wry Neck. (R. H. Sayre.)

birth, but such deformity more properly belongs to the acquired variety.\*

**Acquired Torticollis.**—This is far more common than the congenital form, and in the early stages it is usually accompanied by pain and by local sensitiveness of the affected parts. If the deformity is allowed to persist, however, it may become fixed by the adaptive shortening of the tissues, although the original cause of the distortion may have disappeared. †

Acquired torticollis may be divided into two classes: (1) The Acute, (2) The Chronic.

Acute torticollis may be divided into three classes:

- |                           |   |                                                                                                                                                                                                                                                                                                                                    |
|---------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Acute Torticollis.</b> | { | <p>(a) "Stiff neck," due to "cold" or to rheumatism.</p> <p>(b) Distortion caused by strain or other injury ("Traumatic torticollis").</p> <p>(c) Distortion due to irritation of the peripheral nerves following "sore throat," or secondary to enlarged or suppurating cervical glands, and the like ("Reflex torticollis").</p> |
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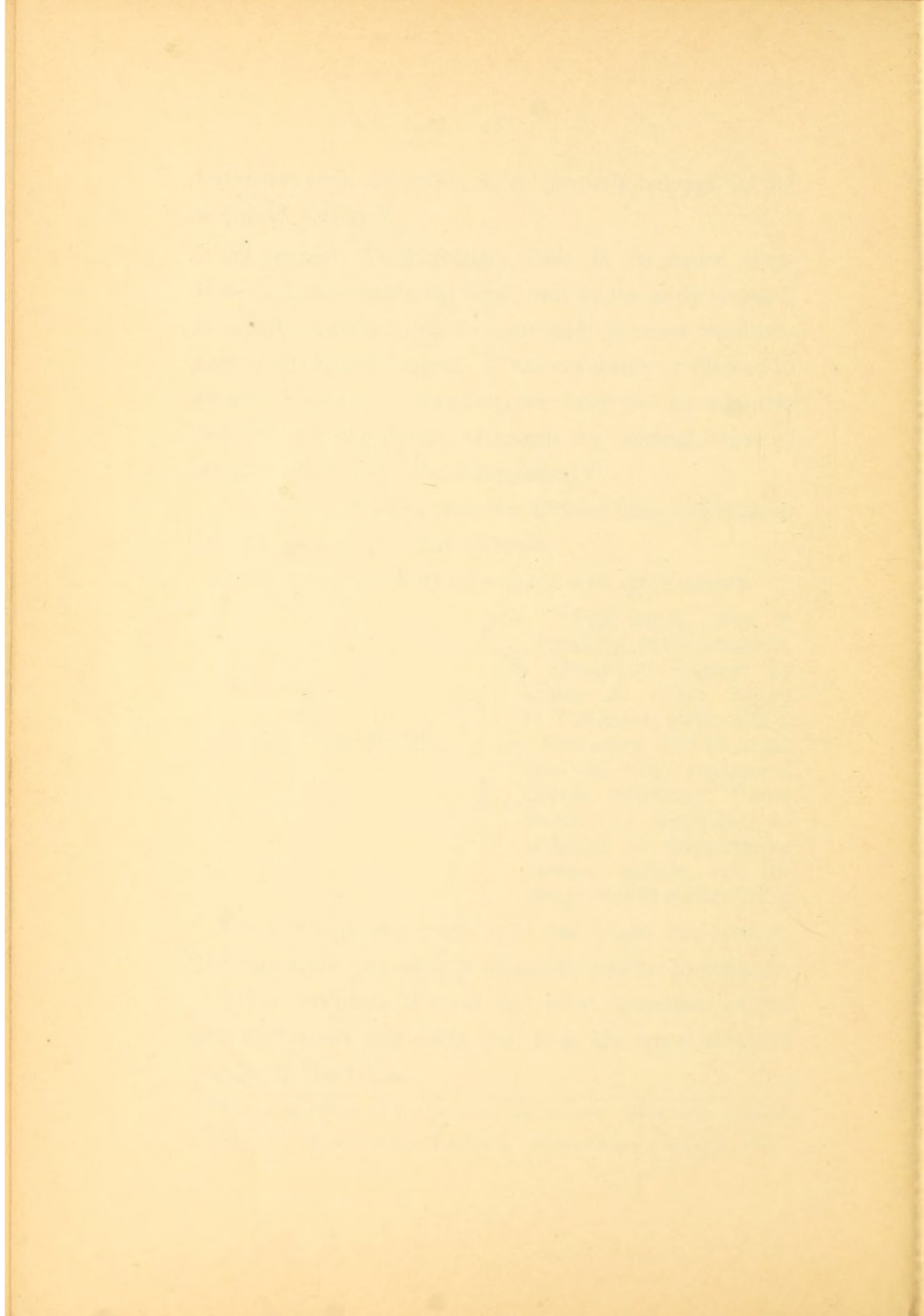
The ordinary stiff neck is of but slight importance. The traumatic wry neck is efficiently treated by support.

Reflex torticollis is by far the most important of the forms of acute torticollis, and it is the usual cause of persistent distortion.

\*What is hæmatoma of the sterno-mastoid muscle? What is its supposed significance?

†Whitman, Observations on Torticollis. *Medical News*, October 24, 1891.





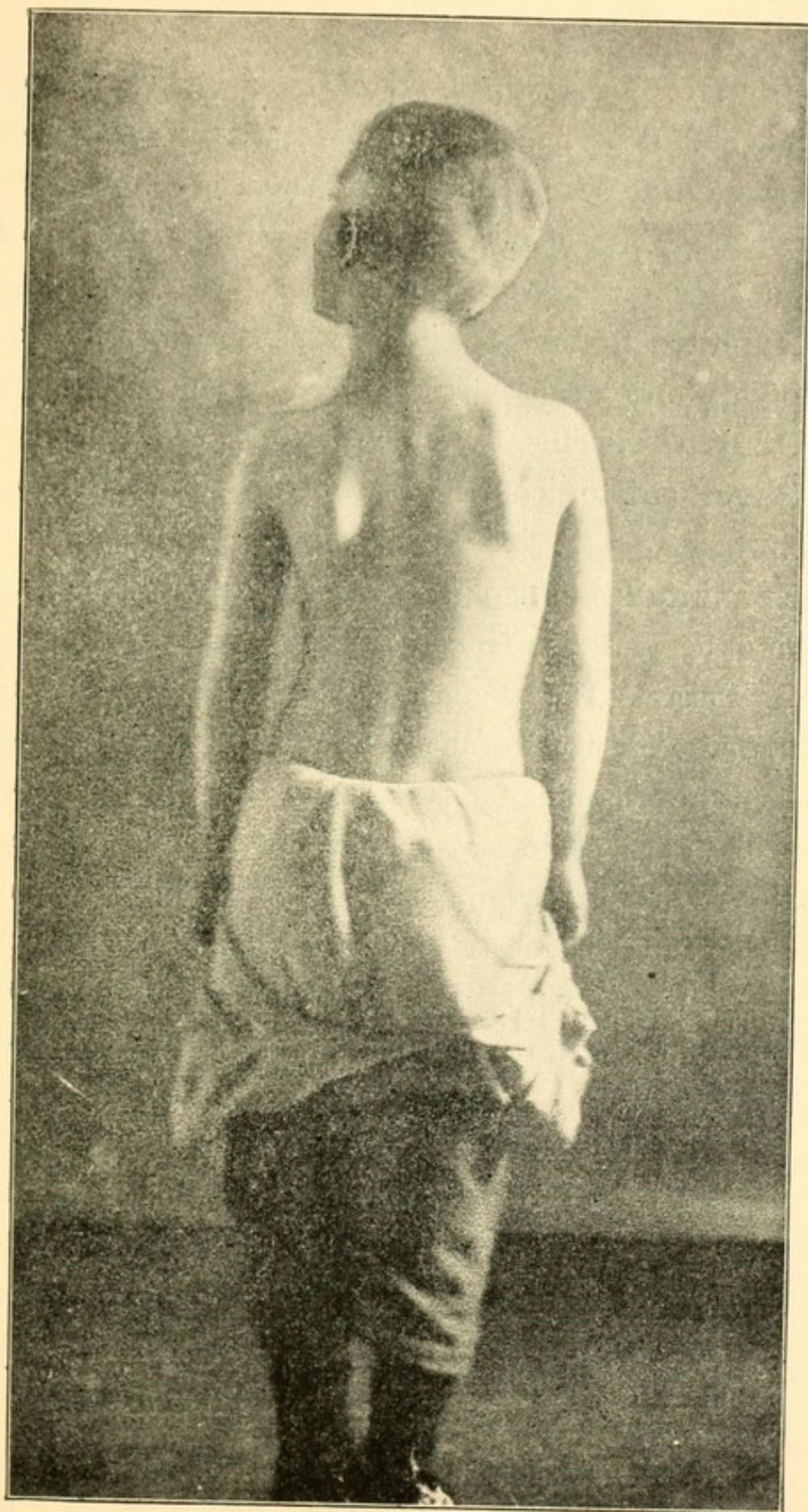


FIG. 33.—Posterior Aspect of the Case in Fig. 32.



**Chronic Torticollis.**—From the clinical standpoint, both the congenital and the reflex torticollis, after the acute stage has passed, are forms of chronic torticollis; the class includes also those forms in which the onset has not been accompanied by pain.

**Rachitic** torticollis, usually a postural or compensatory distortion caused by deformity of the spine.

**Ocular** torticollis, caused by defective eye-sight.

**Psychical** torticollis, a functional or hysterical deformity.

**Spasmodic** torticollis, a convulsive *tic*,—rather a form of nervous disease than a simple deformity.

**DIAGNOSIS.**—The diagnosis should include an investigation into the cause of the trouble, and it is usually not difficult to determine the type of wry neck with which we have to deal. Acute cases may be mistaken for the distortion of the head symptomatic of Pott's disease. For the differential diagnosis, see that section.

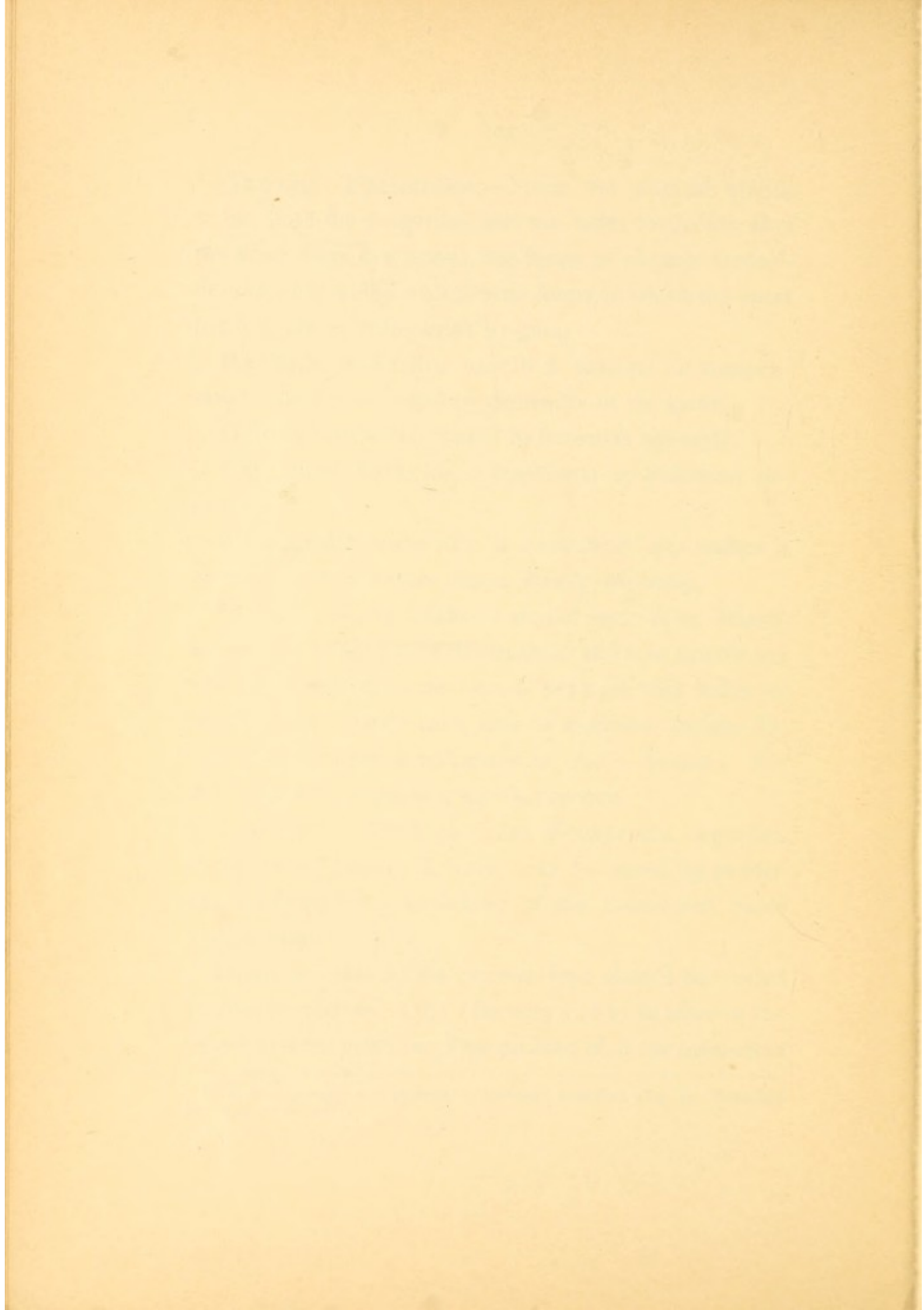
**TREATMENT.**—The slight forms of congenital torticollis, if discovered in early infancy, may be cured by persistent manipulation,—stretching of the contracted tissue and massage.\*

Persistent cases of the chronic type should be treated by over-correction of the deformity and by fixation in the over-corrected position. Free division of all the contracted

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\*Why are massage and gymnastic exercises indicated after the deformity has been corrected?





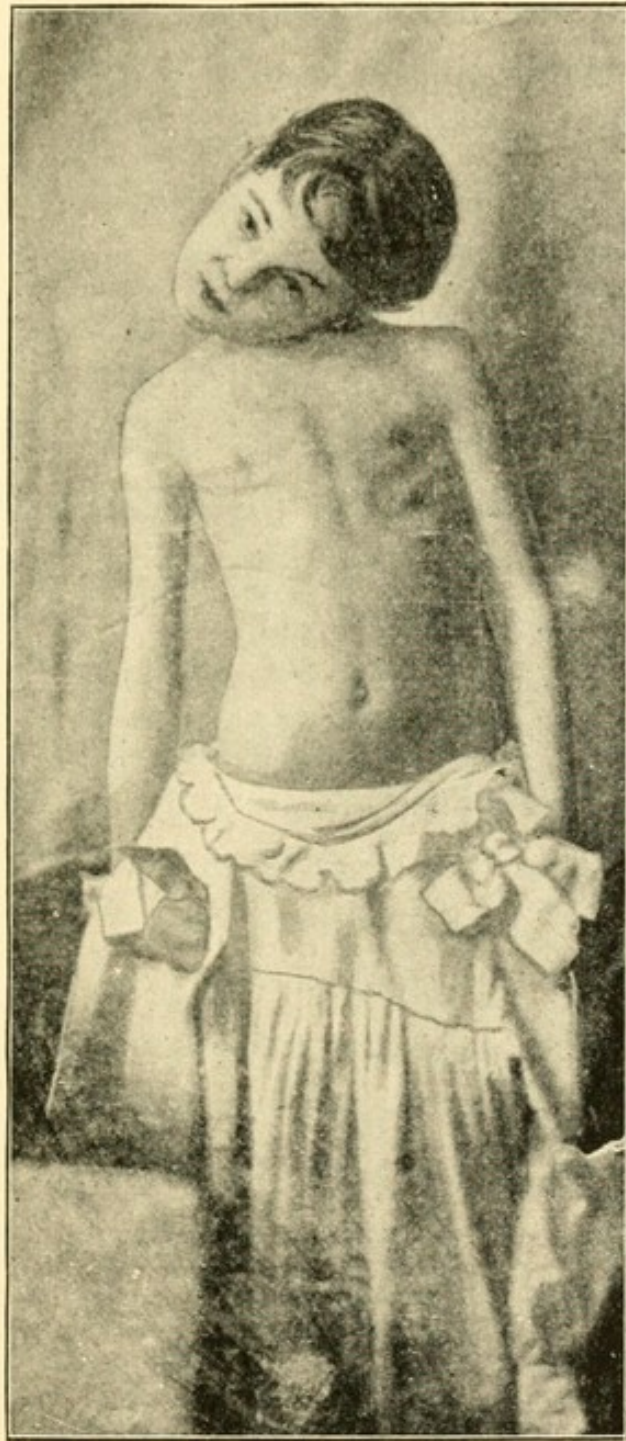


FIG. 34.—Cervical Pott's, with Extreme Distortion of the Neck. (R. H. Sayre.)

parts is usually necessary, although in the milder type forcible stretching under anæsthesia may be sufficient.

Acute torticollis should be treated by support. If reflex torticollis be treated at an early stage, pain may be relieved and deformity may be prevented. The plaster of Paris jacket with the jury-mast is an efficient appliance.

The other and less important varieties of torticollis should be treated symptomatically. In the treatment of severe spasmodic torticollis, free division of the contracted parts and resection of the nerves that supply the affected muscles, is the only effective treatment.

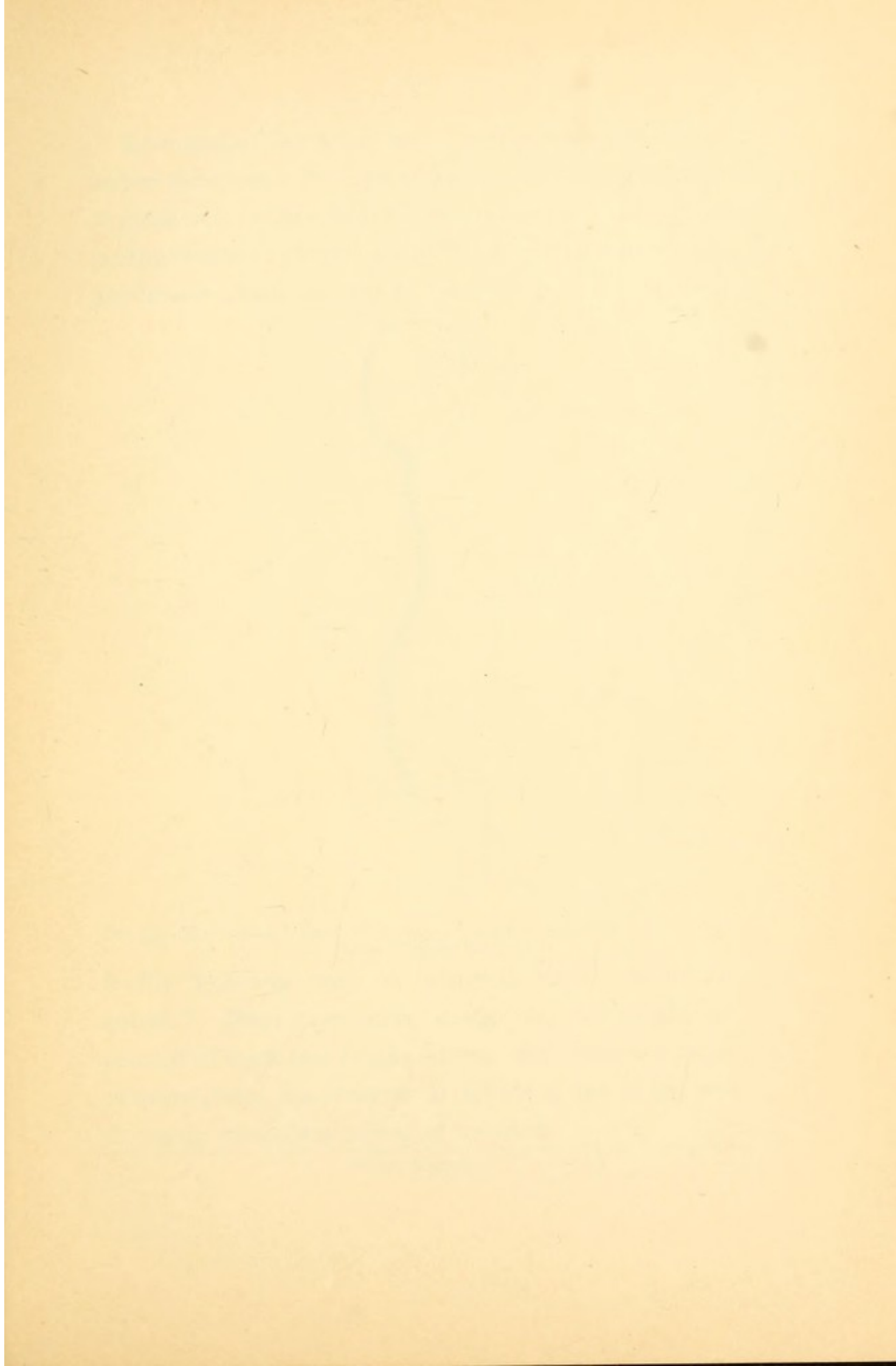
## 2. SCOLIOSIS—(ROTARY LATERAL CURVATURE OF THE SPINE).

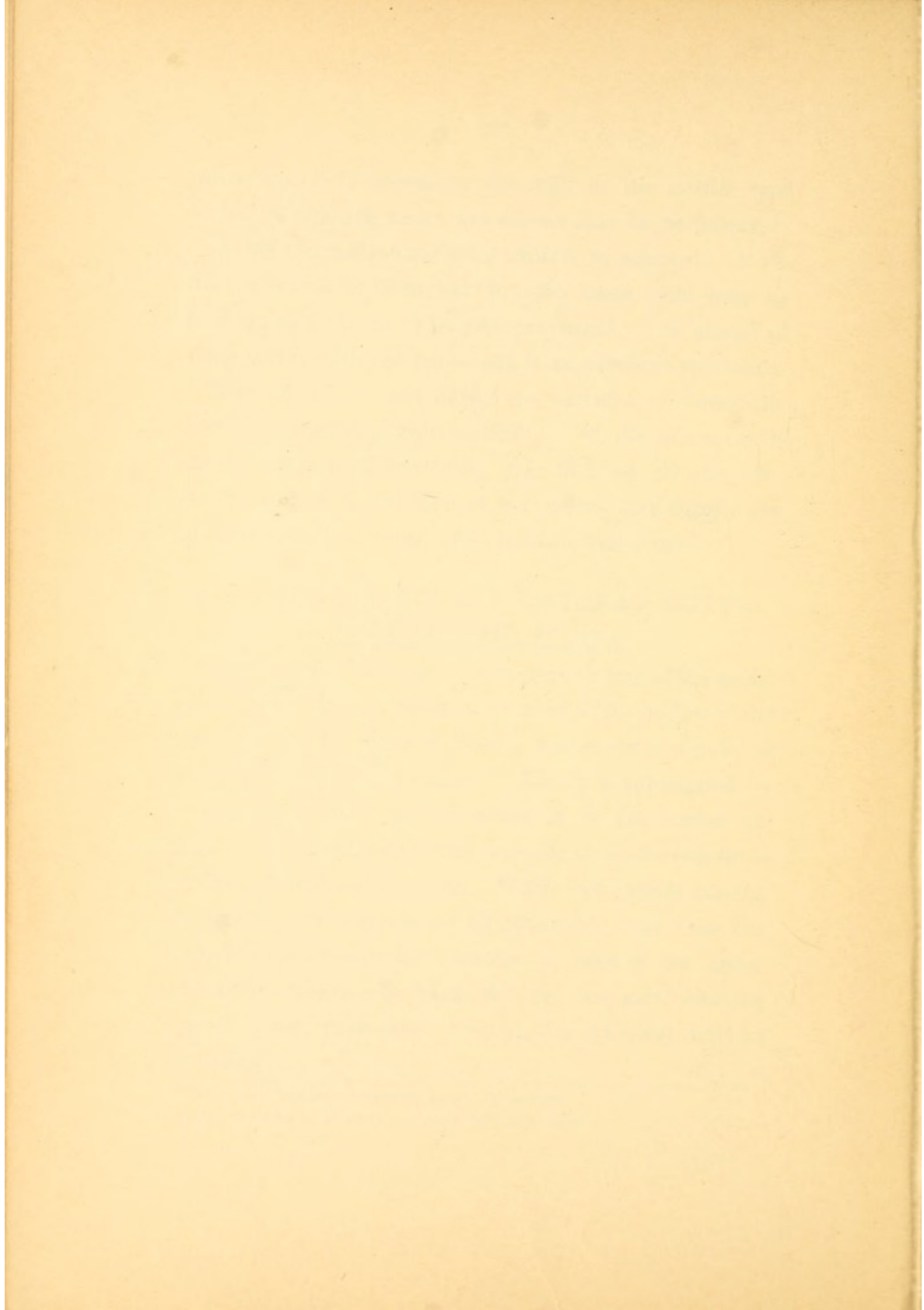
DEFINITION.—Scoliosis is a lateral deviation of the spine, accompanied by a twisting or rotation of the bodies of the vertebræ.\* The more noticeable curvature is usually to the right in the dorsal region. This is compensated by a curvature in the opposite direction in the lumbar region.† Not infrequently there may be three curvatures—cervical, dorsal and lumbar. When the patient stands, the lateral curve may alone be noticeable, but when the body is bent forward the rotation or twist of the spine, which throws the ribs backward on one side, forming a more or less prominent “hump,” is the most marked distortion.

---

\* Why does rotation accompany lateral deformity?

†What is meant by primary and secondary deformity?





ETIOLOGY.—The great and primary cause of rotary lateral curvature is the force of gravity; thus, the deformity is practically limited to the human subject. The predisposing causes in general are bodily weakness and disproportionate strain to which the weak part is subjected.

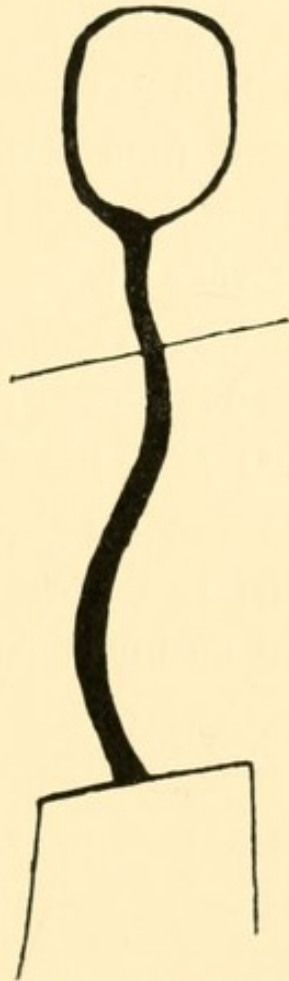


FIG. 35.—The Ordinary Form of Scoliosis. The high shoulder and the high hip on the same side.

Bodily weakness may be inherited, or it may be acquired.\* Disproportionate strain may be simply the amount of work that causes fatigue, and induces a faulty attitude; thus, confinement at school is one of the predisposing or exciting causes of scoliosis.

---

\* Give examples.



There are other, and more direct causes of this deformity. For example, it may be congenital. It may be secondary to torticollis, or to deformity at the hip, or to inequality of the legs. It may be a result of disease of the lungs or pleura, or of paralysis; or it may be due to direct injury.

It is probable that slight distortions of the spine may exist, as it were, latent from early childhood. These may be aggravated to noticeable deformity during later childhood and adolescence.\* †

The deformity often attracts attention when the clothing is made to conform more closely to the body. At this time the "high shoulder" or the "prominent hip" ‡ is first noticed, it may be, by the dressmaker. There are no symptoms peculiar to the deformity, although discomfort, rather of the quality of fatigue than of actual pain, may be complained of. Pain, however, is not unusual in older subjects.

DIAGNOSIS.—The diagnosis is evident on inspection. It is a deformity unattended by pain on motion, or by symptoms of disease.

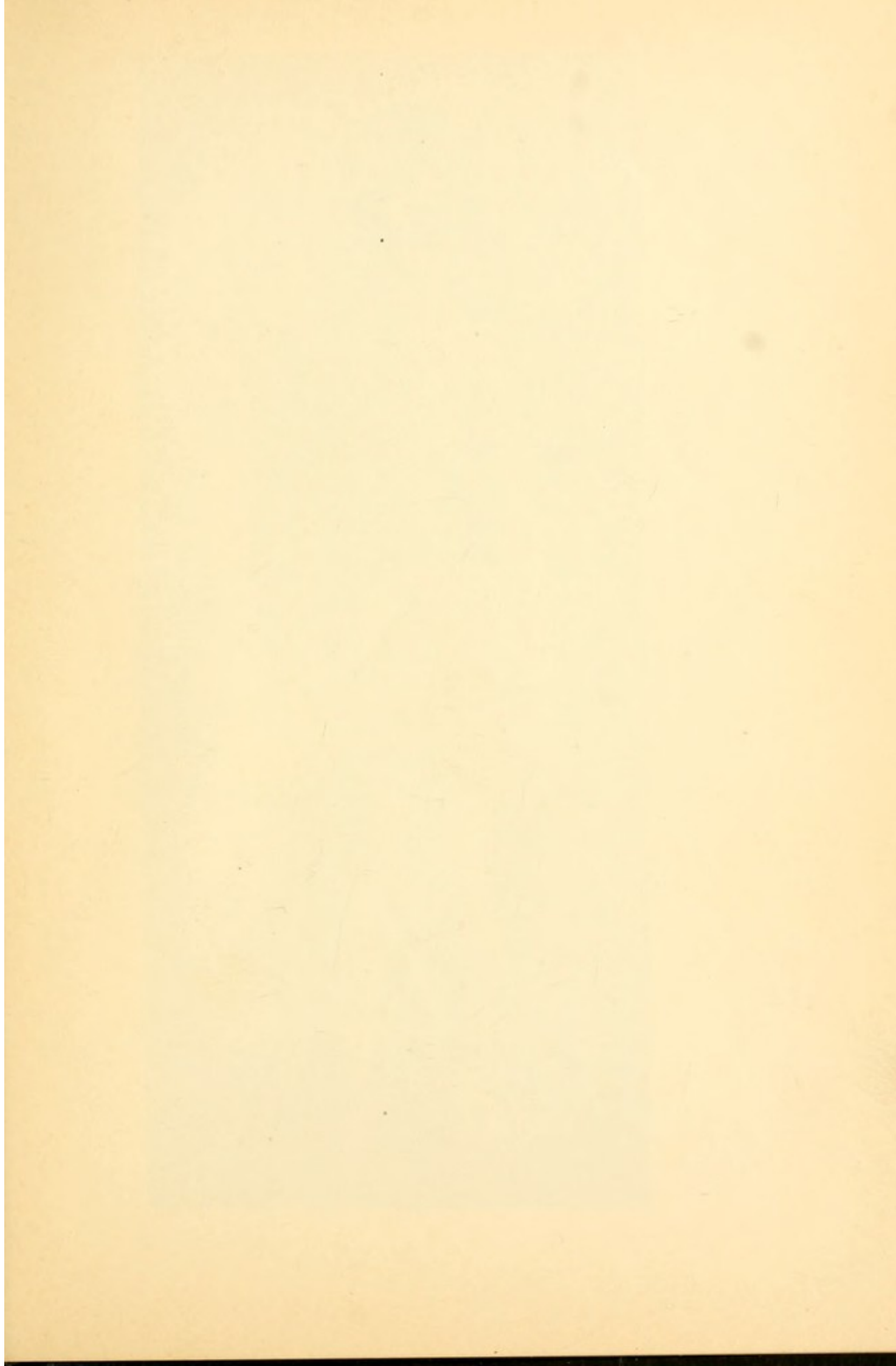
PROGNOSIS.—The extreme degrees of deformity are, as a rule, caused by empyema or paralysis, or by severe rachitis. If scoliosis does not appear until adolescence, it may, as a rule, be checked by proper treatment.

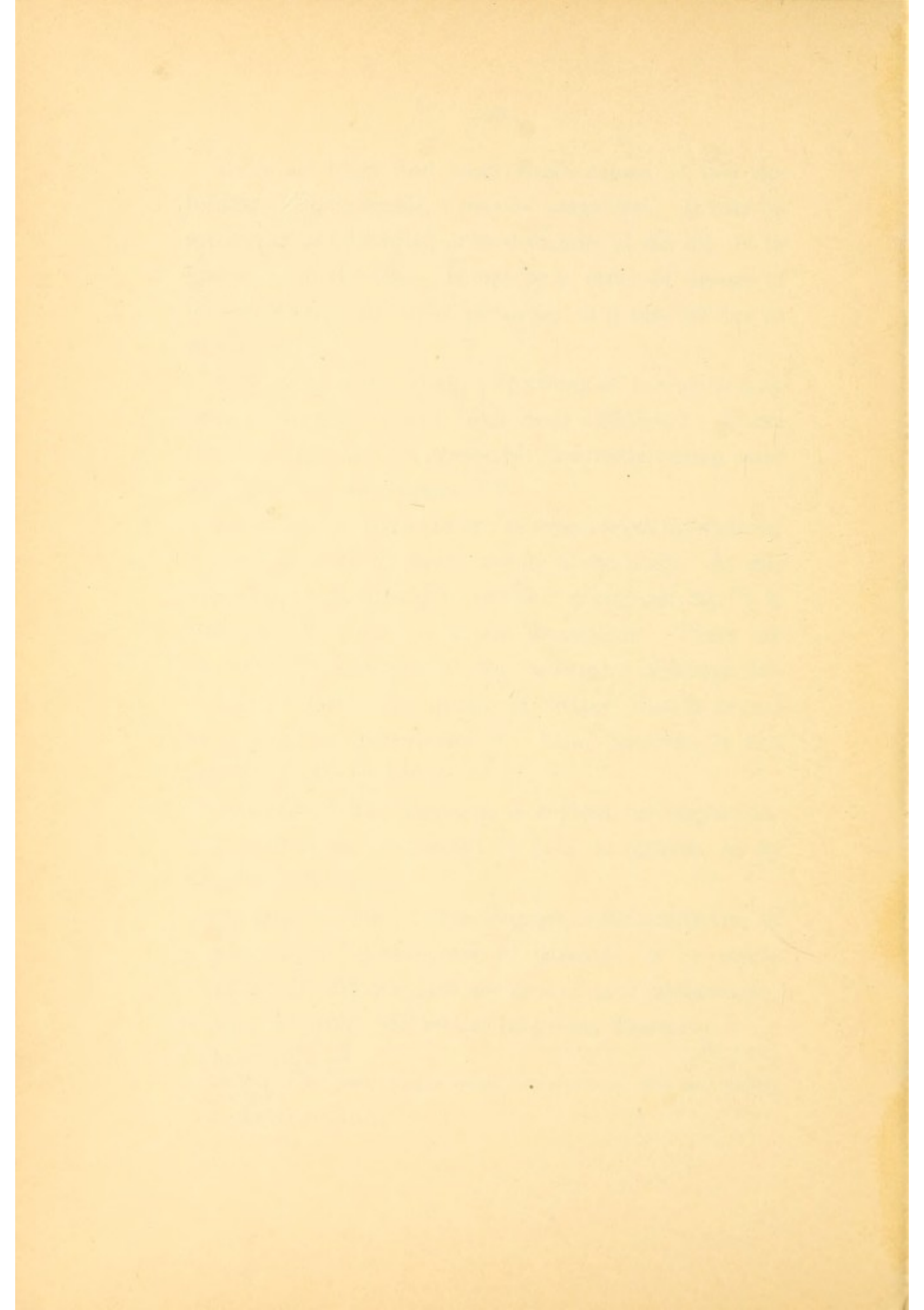
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\* Why at this time ?

† Scoliosis is far more common among girls than boys. How may this fact be explained ?

‡ Explain the mechanism.





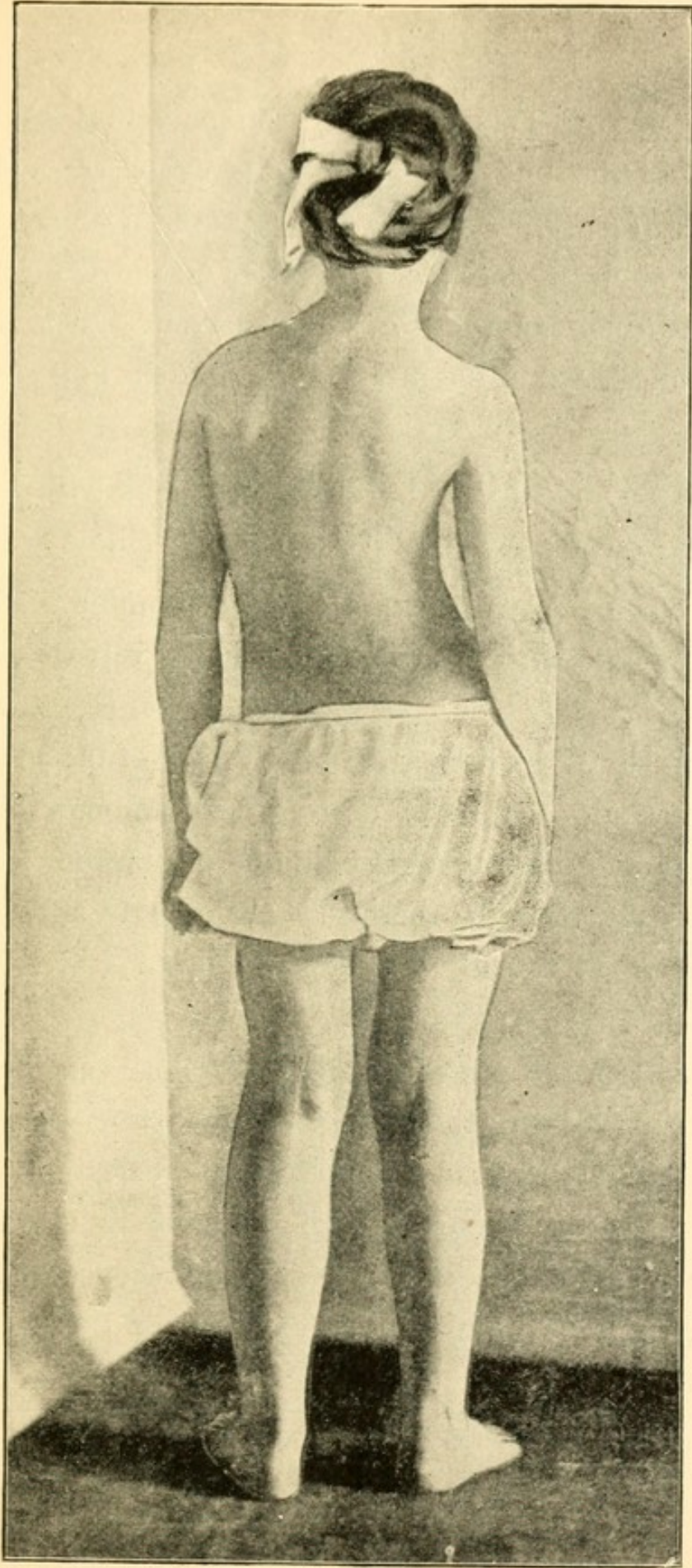


FIG. 36.—Rotary Lateral Curvature. (R. H. Sayre.)

**TREATMENT.**—This consists in strengthening the resistance of the body by appropriate exercises, and in avoiding, if possible, fatigue and improper postures. In younger subjects, forcible correction of the deformity, with subsequent support, may be of service. This is especially indicated in the rachitic type of deformity.\*

### 3. OTHER POSTURAL DEFORMITIES OF THE SPINE.

(a) **Round Shoulders.**—This is a common postural or static deformity. It is also induced by various occupations.

Round shoulders or posterior curvature of the spine is usually accompanied by a flat chest. In young subjects both may be caused by obstruction to respiration, in the nasal passages or in the throat, for example, by adenoids, or by enlarged tonsils, less often by bronchitis, or disease of the heart.

**TREATMENT.**—Remove the predisposing causes and strengthen the patient by appropriate gymnastic exercises. Support by braces is indicated in certain cases.

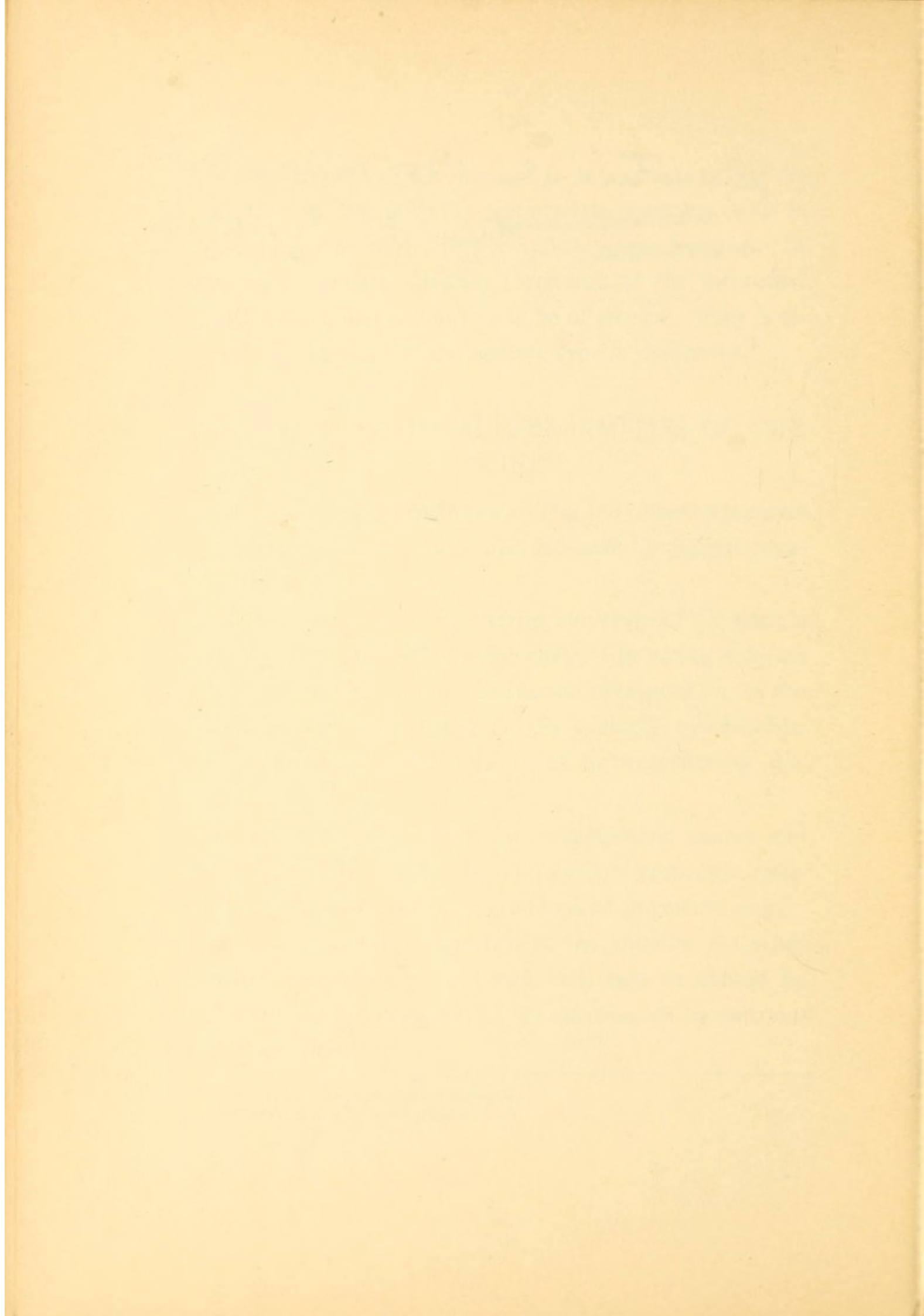
General posterior curvature of the spine in the adult may be incidental to old age, or it may be caused by disease, as, for example, by rheumatism or by rheumatoid arthritis.†

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\* Mention the indications for support.

† Describe this form of curvature.

Asymmetrical Exercises  $\bar{c}$   
dumbbells.



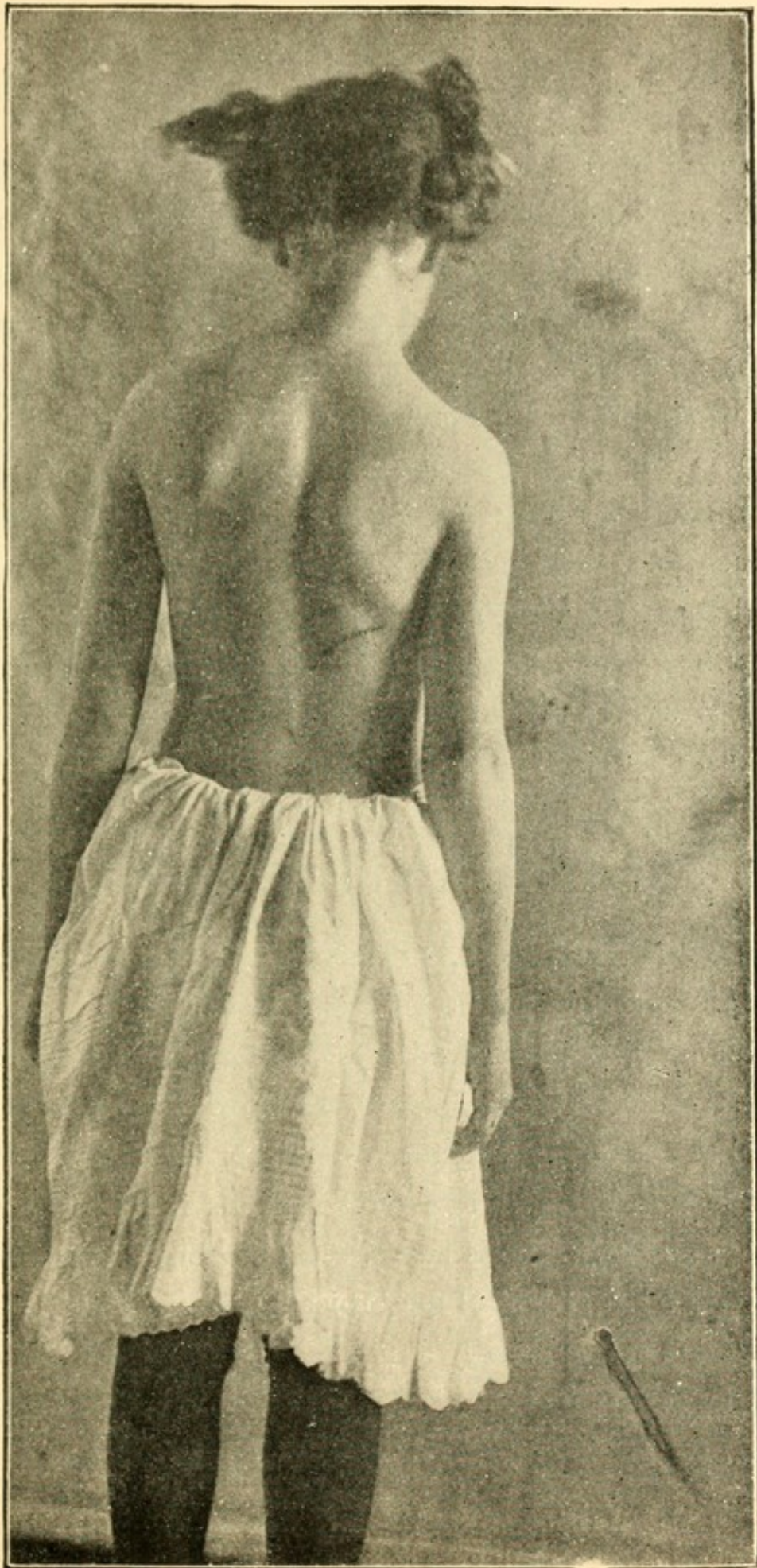


FIG. 37.—Rotary Lateral Curvature from Emphyæma. (R. H. Sayre.)



(*b*) **Lordosis.**—The “hollow back.” The hollow back may be inherited; it may be incidental to occupation, as seen in acrobats; it may be compensatory for contractions or displacements at the hips, for example, in hip disease or in congenital displacement of the hips, or it may be a result of a kyphosis in the dorsal region. The treatment must be directed to its cause.

(*c*) **Spondylolisthesis.**—This is a displacement of the lower lumbar vertebræ forward upon the sacrum, the subluxation being most often of the body of the fifth vertebra upon the sacrum.

**SYMPTOMS.**—Shortening of the trunk, and abnormal lordosis and discomfort in the lumbar regions.

**CAUSES.**—Defective development, pregnancy, injury.

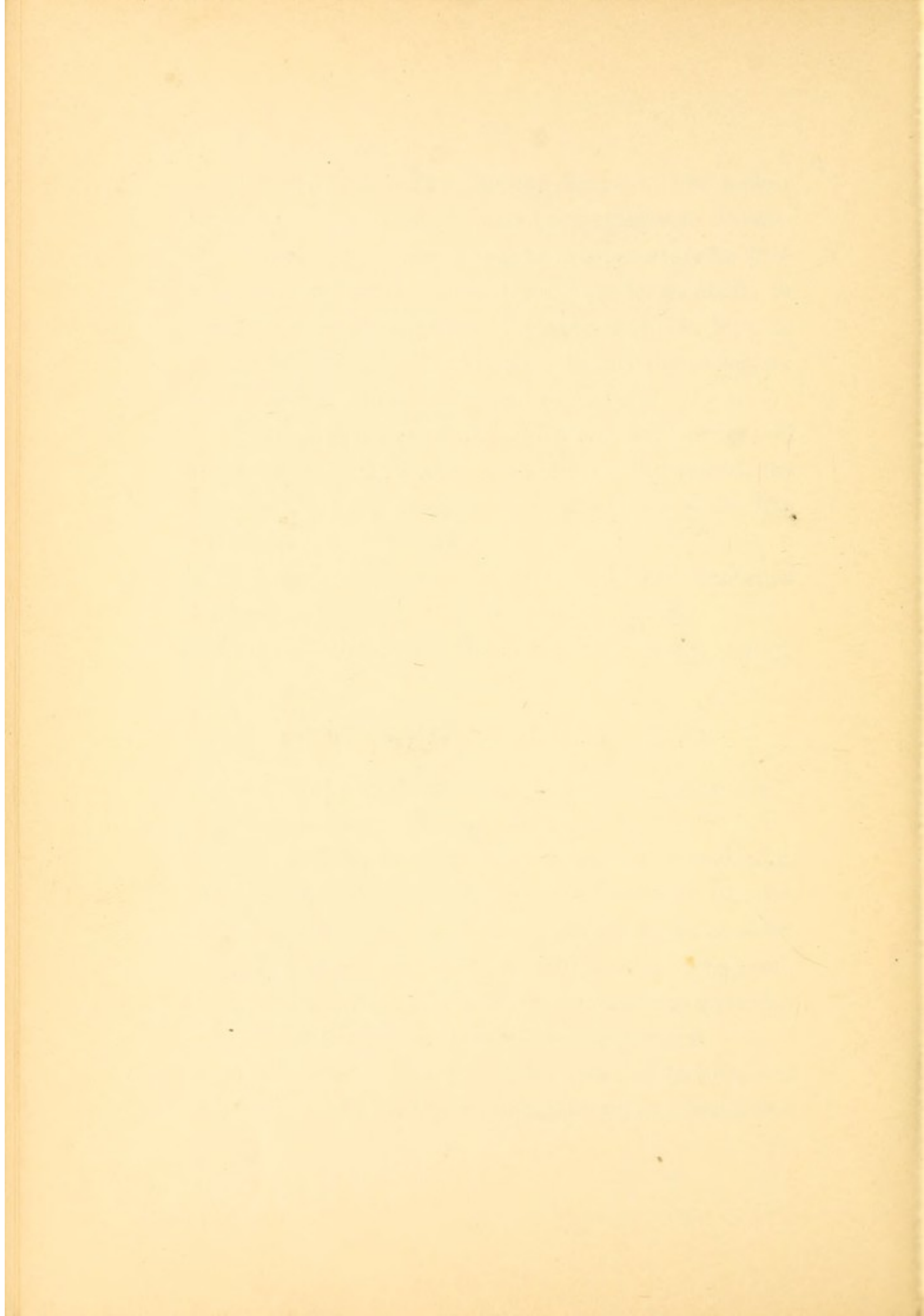
#### 4. DEFORMITIES OF THE CHEST.

(*a*) **Chicken Chest.**—Pigeon breast, or, more properly, pigeon chest. *Pectus Carnatum.*

This, in its milder grades, is a common deformity. The sternum is thrust forward and downward like the “keel of a boat.” The antero-posterior diameter of the chest is increased, and its lateral diameter is correspondingly diminished. This lateral compression is especially marked on either side of the projecting sternum.

Pigeon chest is usually a direct result of rachitis, and in its most extreme degree during the active stage of that





affection. It may be a secondary deformity of Pott's disease of the dorsal region.\*

Pigeon chest may be treated by removal of its predisposing causes and by exercises to increase the capacity of the chest.

(b) **Funnel Chest.**—Pectus Excavatum.

This deformity is the direct opposite of pigeon chest. Thus, there is a depression of the sternum, and on either side the chest-wall bulges forward; thus its lateral diameter is increased, and the antero-posterior diameter is diminished.†

The deformity is almost always congenital. The sternum is weak, and it may be absent in part. This, of course, may be a cause or a consequence of the malformation. The mild degrees of the deformity are not uncommon. It causes no symptoms, and it is not susceptible to treatment.

---

\* Explain its mechanical causes.

† Explain its mechanical causes.

## V. RACHITIS—(RICKETS).

### I. GENERAL CONSIDERATIONS.

Rachitis is a disease of early infancy and childhood, caused by defective nutrition, of which the most marked effect is distortion of the bones. In the etiology of the disease a certain number of predisposing and exciting causes are usually recognized. The principal predisposing cause is constitutional weakness, either inherited or acquired. Usually it is a result of improper hygienic surroundings. The exciting cause is defective nutrition. This may be the result of the substitution of artificial food for the mother's milk, or to improper diet after weaning. Thus rachitis more often develops during the first or second year of life.

The general symptoms of the disease need not be mentioned here, as they properly belong to the practice of medicine.

The pathologic changes in the bones are characterized by a diminution of the earthy substance and an overgrowth of osteoid tissue.\* There is an exaggeration of the processes immediately preparatory to the development of true bone,† and imperfect conversion of this pre-

---

\* Describe the minute anatomy of a rachitic bone.

† Where are the abnormal characteristics most marked?





paratory tissue into true bone, and, finally, a great irregularity in the whole process. (Erichsen.)

For the present purpose, it is sufficient to say that the resistance of all the tissues is diminished, and that the softened bones become deformed. The deformities due to rachitis depend upon its severity and upon its duration.

The deformities of infantile rachitis are usually more marked in the trunk and upper extremities; of the later and milder form, in the lower extremities. In the first instance the child sits and creeps; in the later, it stands and walks.\*

The more important rachitic deformities are:

1. Rachitic kyphosis,
2. Rachitic scoliosis,
3. Chicken (or pigeon) chest,
4. The rachitic pelvis,
5. Cubitus valgus or varus,
6. Distortion of the lower extremities:
  - (a) Genu varum,
  - (b) Genu valgum,
  - (c) Anterior curvature of the tibiæ,
  - (d) General distortions of the lower limbs.

These deformities are treated for convenience under the heading of rickets, but it must be borne in mind that some of them may be due to other causes.

---

\* Duration and treatment of rachitis ?



## 2. RACHITIC KYPHOSIS.

This deformity has been described elsewhere. It is a posterior projection of the middle and lower portions of the spine, more or less rigid according to its duration. Its formation and situation are explained by the habitual assumption of the sitting posture. It is, therefore, most often seen in children under two years of age.

TREATMENT.—Massage. Methodical manual correction. The prevention of attitudes that favor or increase the distortion.

In severe cases a spinal brace, or even fixation upon the Bradford frame or similar appliance, may be indicated.

## 3. RACHITIC SCOLIOSIS.

Rotary lateral curvature of rachitic origin is not infrequently seen in young children. The principles of treatment are similar to those described above, forcible manual correction and support being of special importance.

## 4. CUBITUS VARUS AND VALGUS.

These are deformities at the elbow, corresponding to genu varum and valgum in the lower extremity. They occur in rachitic children who sit or creep; not infrequently they are combined with distortion of the forearms. These deformities are not often extreme, and, as a rule, they disappear without special treatment.\*

---

\* Why is natural cure in deformities of the upper more common than in those of the lower extremity?









**Rachitic deformities of the pelvis** are of particular interest to the obstetrician.

### 5. GENU VARUM AND BOW-LEGS.

These two terms are often used synonymously, although bow-leg means distortion of the lower leg, while genu varum signifies an outward bowing at the knee. As a rule, the two are combined.

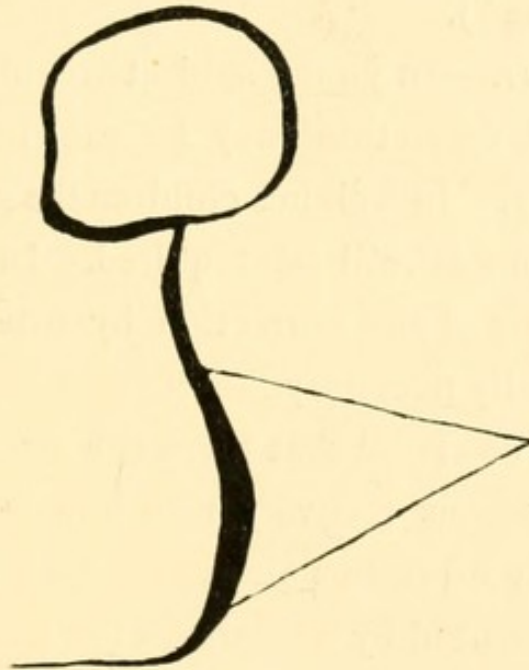


FIG. 38.—The Situation and Character of Rachitic Kyphosis. An effect of weakness and of the habitual assumption of the sitting posture.

**ETIOLOGY.**—Bow-leg is one of the common rachitic distortions, but it is by no means infrequent in robust infants who stand and walk at an early age. It may be a congenital deformity even, and in adolescence or adult life it may be acquired or increased by occupation, or by injury or disease.

SYMPTOMS.—The deformity is the chief symptom. This does not, as a rule, cause discomfort or disability, except in the exaggerated degrees of genu varum proper. Usually both extremities are affected, although, in exceptional instances, the deformity may be unilateral or combined with knock-knee of the opposite side. The gait is usually of a somewhat rolling or waddling character, and there is often slight inward rotation of the leg (“pigeon-toe”).

TREATMENT.—In young subjects regular manipulation and manual correction may be sufficient to overcome the deformity. In walking children the support and correction of braces will be required. In children more than five years of age correction by osteotomy or osteoclasis is usually necessary.

It should be stated that there is a strong tendency toward spontaneous recovery from bow-leg deformity, but that this is by no means always the case is shown by the evidence presented by walkers on the street.\*

#### 6. GENU VALGUM—(KNOCK-KNEE).

Genu valgum is much less common than genu varum. It is a more serious deformity, and it more often develops in adolescence, than does the other affection. In childhood it is almost always the result of rickets. The tendency toward the deformity may be acquired before the

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\* Whitman, *New York Medical Record*, July 30, 1887.





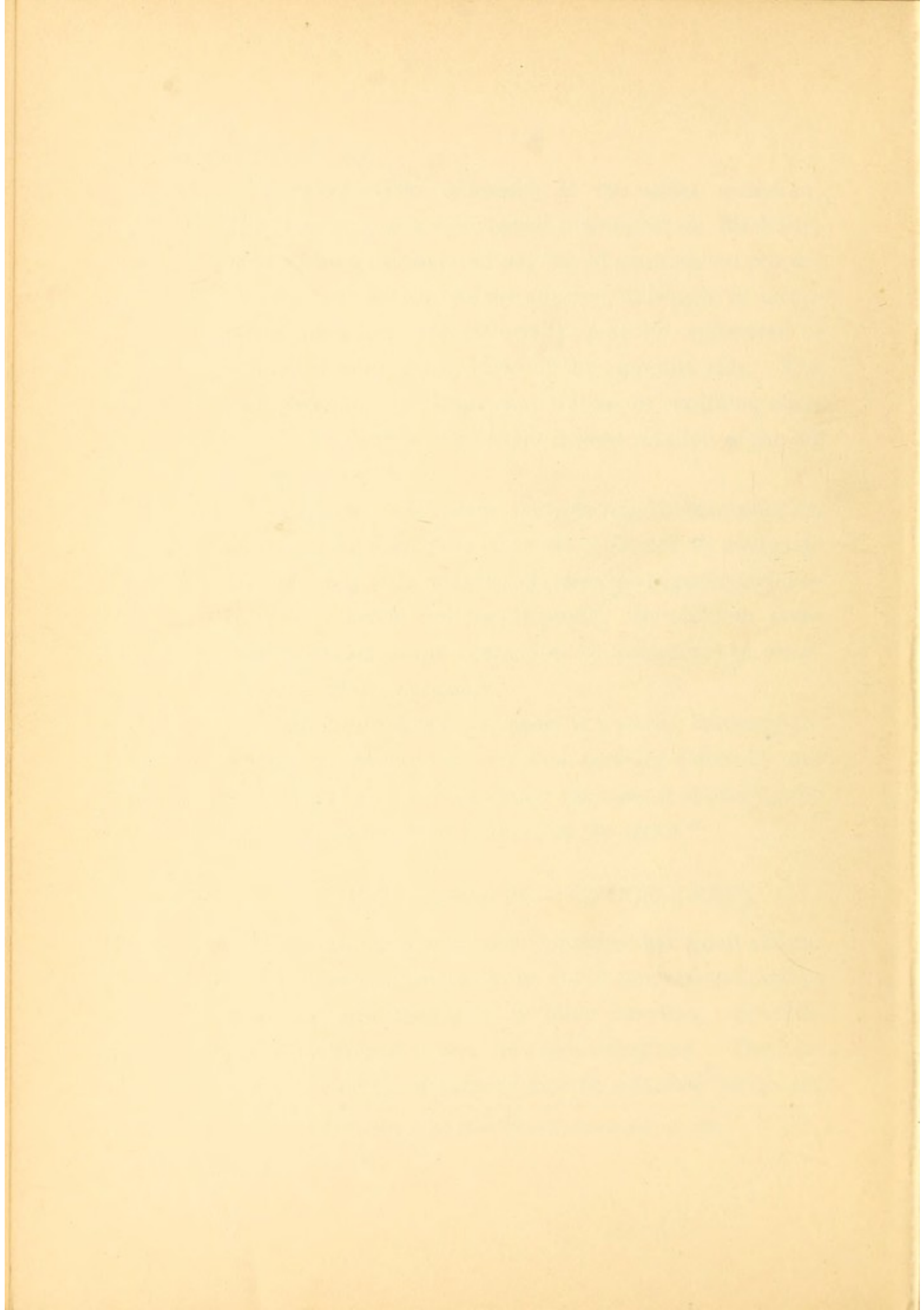




FIG. 39.—Rachitic Bow Legs. (Barbour.)

child walks, and this tendency develops into actual deformity when it stands. The relation of the bones of the lower extremity in knock-knee is an exaggeration of that of the "attitude of rest," and the habitual assumption of the "attitude of rest" induced by fatigue predisposes therefore to knock-knee.

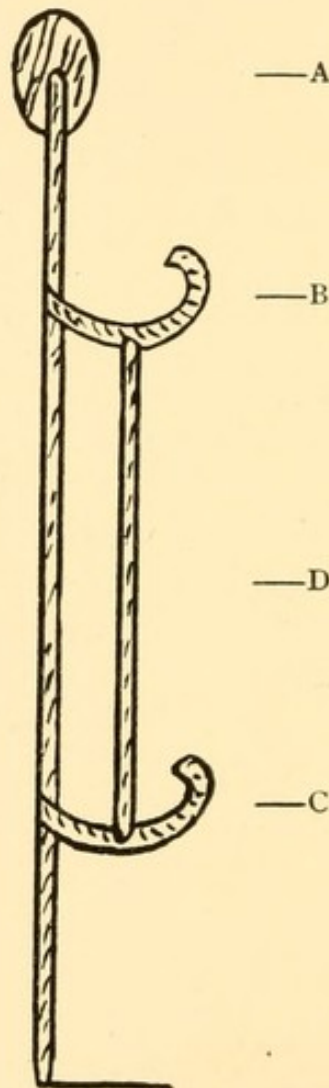
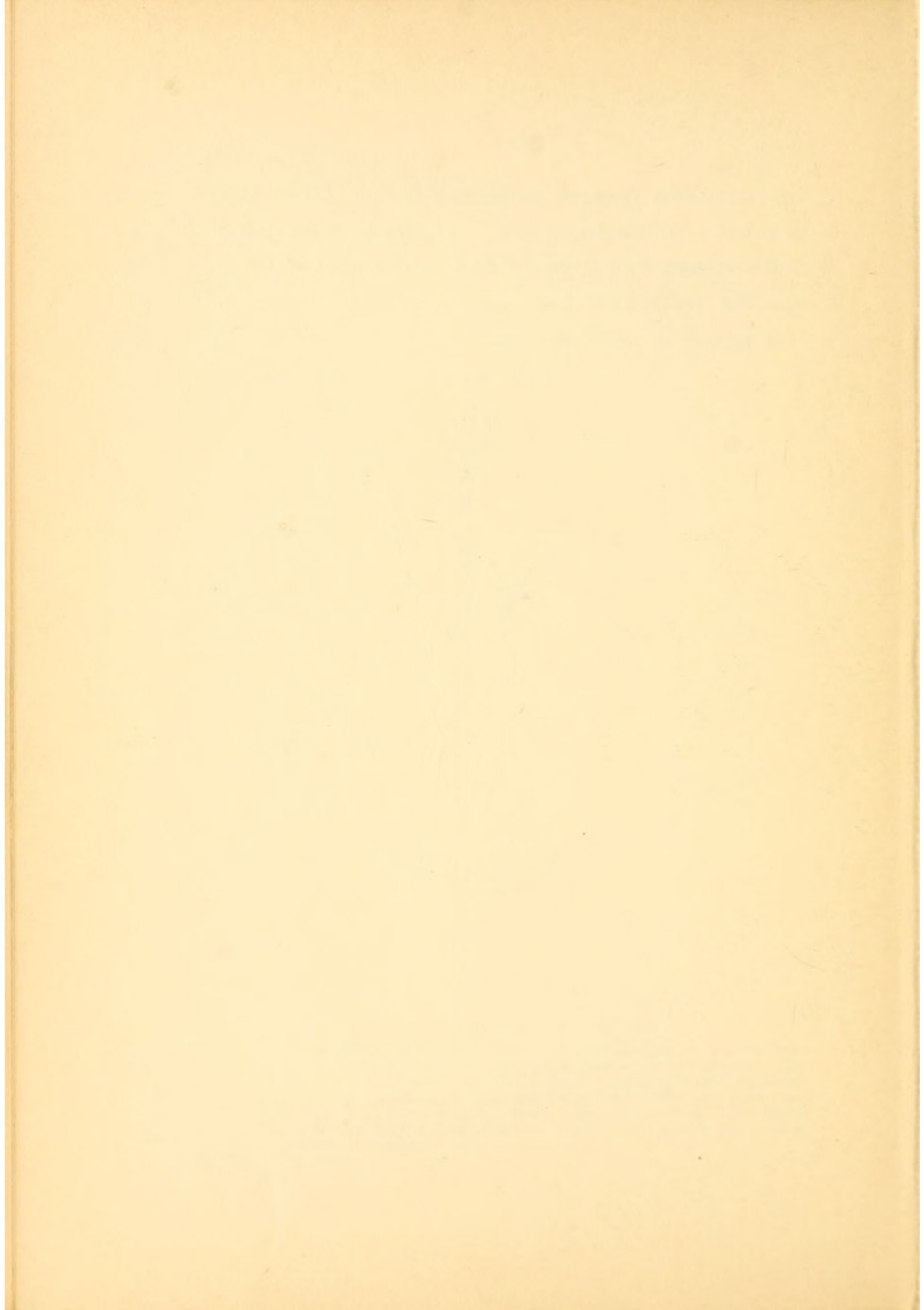


FIG. 40.—*The Thomas Knock-Knee Brace.* A steel upright, A, reaches from the trochanter major to the heel of the shoe, into which it is inserted. (B) and (C) are thigh and calf bands of thin metal, encircling two-thirds of the thigh at its upper third and the middle of the thigh. The two bands are connected by a posterior bar (D), which supports the knee. The brace having been applied, the knee is drawn toward the upright and is fixed by a bandage to this and to the posterior bar.





In the deformity of genu valgum the femur and the tibia both incline inward, so that in the erect posture the feet stand apart from one another when the knees are in contact. In knock-knee there is an apparent hypertrophy and elongation of the internal condyle of the femur, and often a corresponding change in the upper extremity of the tibia. These are adaptations to the habitual attitude, and are caused usually by distortions of the shafts of the bones in the neighborhood of the epiphyses. The gait of the patient with well-marked genu valgum is awkward and shambling; the knees interfere and must be assisted, as it were, in the effort to pass one another. As a rule patients are fatigued, and complain at times of discomfort or pain referred to the inner side of the joint.

Knock-knee may be caused also by disease or by injury.

TREATMENT.—The slight cases may be treated by regular manipulation, and by making the sole of the shoe thicker on the inner side. Braces are usually necessary, the Thomas knock-knee brace being one of the most efficient. In the resistant cases osteotomy of the femur, just above the epiphyseal line, is indicated.

## 7. ANTERIOR BOWING OF THE TIBIÆ.

(Antero-Posterior Bow-Leg.)

This is almost invariably a rachitic deformity and it is usually combined with general distortions of the lower

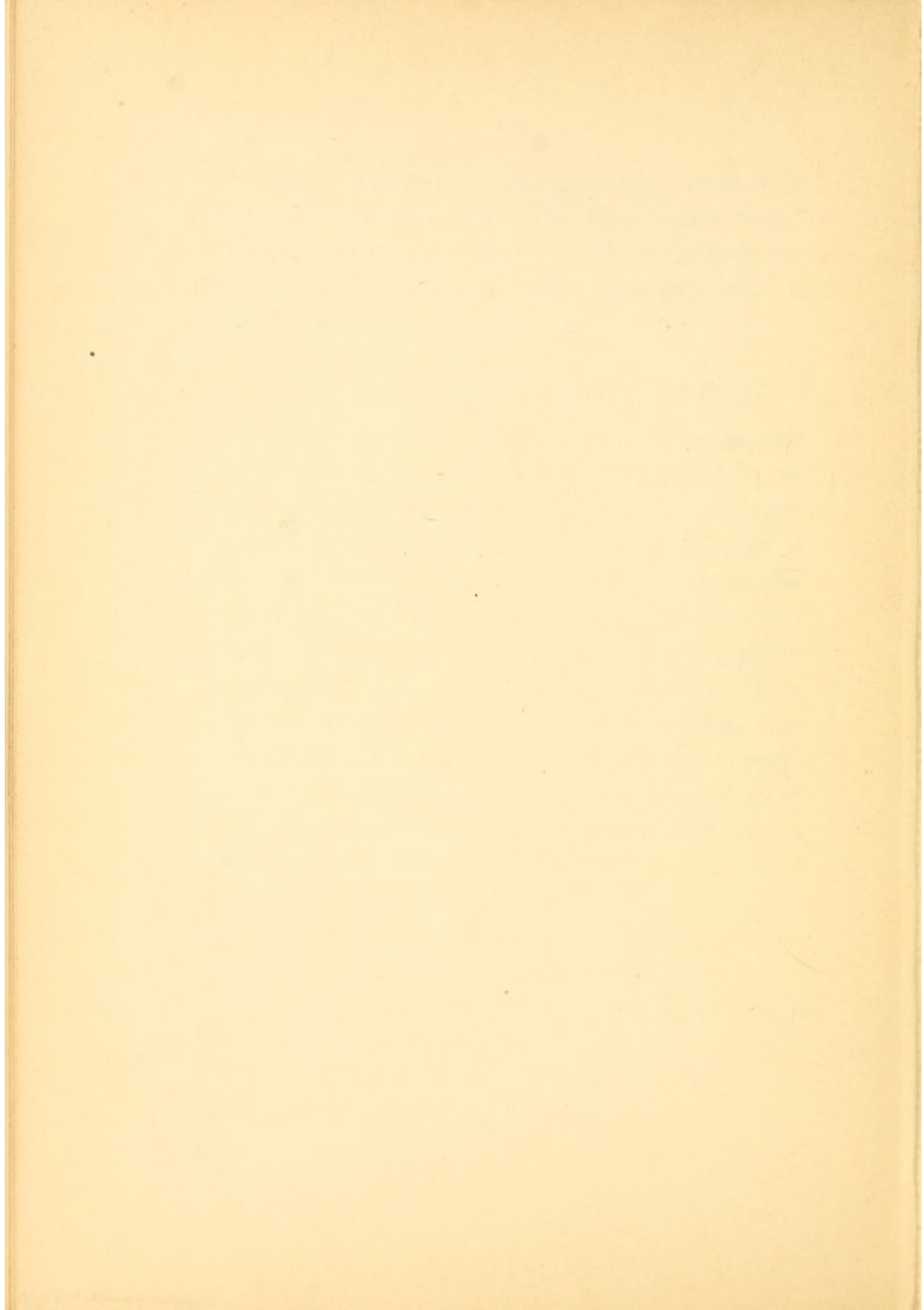
extremities. The crest of the tibia in this deformity is sharp and prominent, hence the name "sabre bone." The deformity, by throwing the weight of the body forward on the foot, causes a peculiar shambling gait. It can be corrected only by osteotomy.

#### GENU RECURVATUM—(BACK KNEE.)

In its most extreme form it is of congenital origin, and is usually associated with defective development of the anterior thigh muscles and of the patella. In such cases the knee is bent directly backwards, and the tibia is often displaced forward upon the femur. In the milder types of back-knee there is simply an abnormal or over-extension caused by laxity of the ligaments and supporting muscles. This form is usually secondary. It is often seen in cases of hip disease after prolonged mechanical treatment. It may be associated with congenital talipes, or it may be the direct result of paralysis of the muscles of the leg, or even of general weakness, as in severe rachitis.







## VI. COXA VARA.

This is a depression of the neck of the femur, usually in a backward direction, occasionally directly downward, rarely downward and forward.\*

ETIOLOGY.—It is more common in males than in females, and it is more often unilateral than bilateral.

The predisposing cause is, in many instances, infantile rachitis. This causes slight depression, sufficient to subject the neck to greater strain. This slight depression is increased in later childhood or adolescence to deformity. Other predisposing or exciting causes are inherited weakness of structure, overstrain, as by occupation and injury. The progress of the deformity is usually slow and often remittent. It is more rapid, however, in adolescence than in childhood, its course varying from one to ten years. Finally the resistance of the compressed bone prevents further deformity, but in some instances the head and neck may be forced downward until they rest against the shaft of the femur.

SYMPTOMS.—The symptoms are explained by the character of the deformity, and by the mechanical changes that it induces. In the ordinary type of unilateral coxa

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\* Why downward and backward?

vara the first symptom is a limp. This may be accompanied by a certain feeling of discomfort, or stiffness, referred to the hip and thigh. As the head of the bone is depressed backward, the limb is rotated outward, the trochanter becomes prominent, and it is elevated to a degree corresponding to the depression of the neck.

The motion of the joint is slightly limited in flexion, in inward rotation, and, to a greater degree, in abduction. If the depression is directly downward, the limb is not rotated outward; if downward and forward, there may be inward rotation and limitation of extension. \*

Coxa vara is similar in cause and effect to other distortions of the lower extremity, except that the deformity is concealed from view. It may be an isolated distortion in a person of otherwise perfect health, or it may be combined with other evidences of weakness. The first symptoms are often noticed after overexertion or over-fatigue, and if the deformity is progressive there may be exacerbations of severe pain, but this is unusual.

**DIFFERENTIAL DIAGNOSIS.**—Coxa vara is often mistaken for hip disease, but the difference in the symptoms of the two affections is well marked. In coxa vara there is from the first actual distortion of the limb, a shortening explained by the elevated and prominent trochanter; there is unequal limitation of the range of motion, and the range of extension may be even increased. As a

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\* Explain these differences.





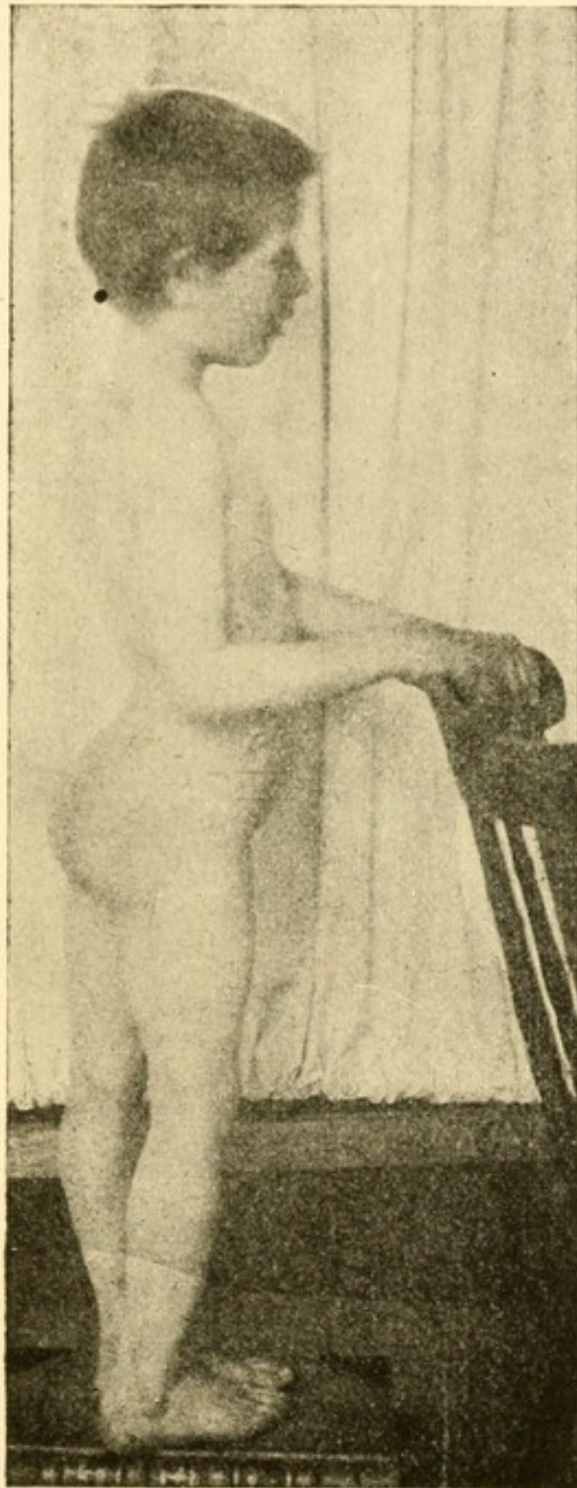


FIG. 41.—Double Coxa Vara of the Anterior Variety, Showing Compensatory Lordosis.

rule, there is no pain on passive motion, nor is there the reflex muscular spasm that characterizes tuberculous disease of the joint.

Coxa vara may be mistaken for congenital dislocation of the hip, but the latter is a congenital disability, while the former is acquired. In congenital dislocation the head of the femur may be palpated in the gluteal region when the thigh is flexed and adducted. This is not possible in coxa vara.

As has been stated, the most noticeable symptom of coxa vara is the persistent limp. At first this is induced, in great part, by actual shortening; but as the deformity progresses and as the range of abduction becomes more limited, apparent shortening, due to upward tilting of the pelvis on the affected side, increases the disability. If the deformity be bilateral, the disability is, of course, much increased, and in extreme cases the knees may be held in close apposition, so that locomotion is very difficult.

**TREATMENT.**—If coxa vara be discovered in the very early stage, it may be possible to check its progress by the avoidance of over-strain and fatigue, and in certain instances by the use of a supporting splint, combined with massage and exercises. But in the majority of cases the neck of the femur should be replaced in its normal position by the removal of a wedge-shaped section of bone from the base of the trochanter. \*

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\* Whitman, *New York Medical Journal*, January 21, 1899, and *ibid.*, June 23, 1894.







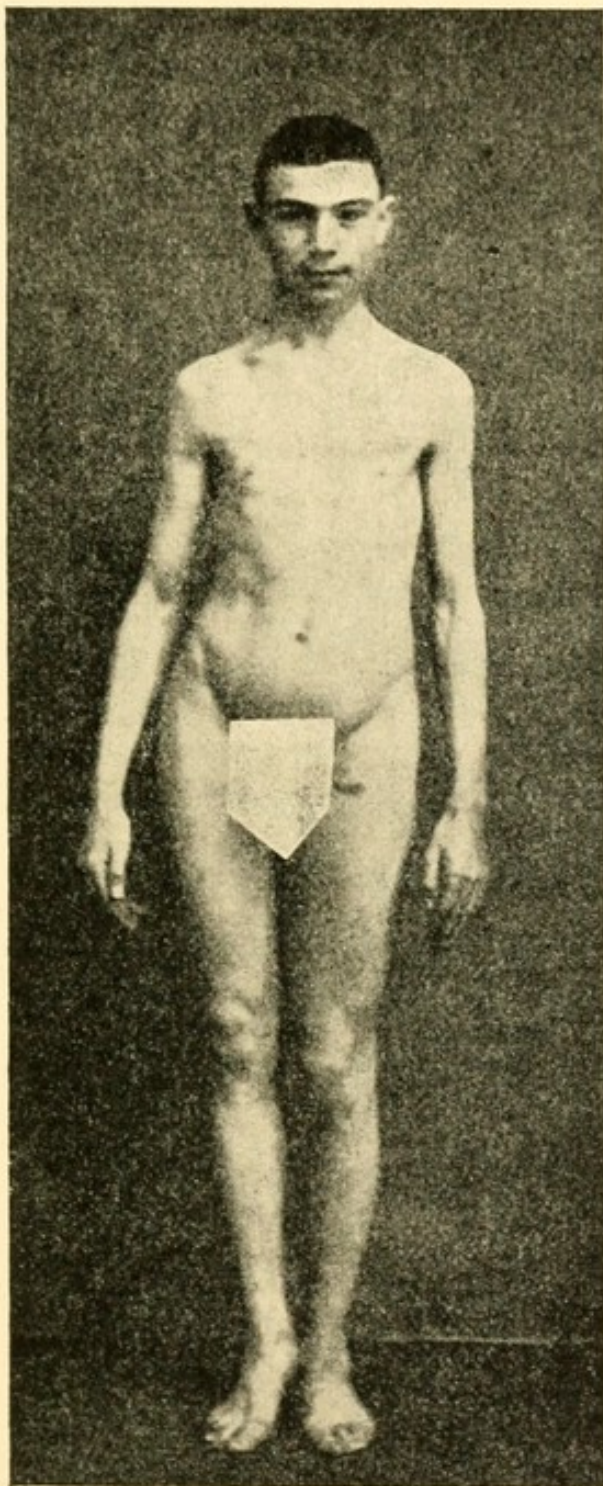


FIG. 42.— A Case of Coxa Vara of the right side, showing the adduction of the limb and the compensatory tilting of its pelvis.

## FRACTURE OF THE NECK OF THE FEMUR.

Fracture of the neck of the femur is not particularly infrequent in early childhood.\* The fracture is not usually complete, but is rather a variety of so-called "green stick" fracture; consequently the patient may be

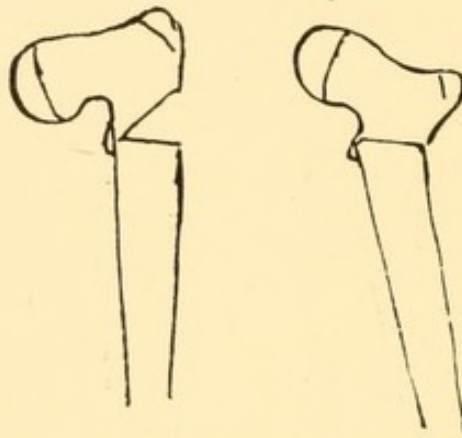


FIG. 43.—Effect of Osteotomy of the Femur in Coxa Vara.

able to walk about within a few days of the accident. The persistent limp and the discomfort is often mistaken for hip disease. It is really a form of traumatic coxa vara presenting the physical signs that have already been described.

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\* Whitman, *Annals of Surgery*, June, 1897, *ibid*, February, 1900.





## VII. CONGENITAL DISLOCATION OF THE HIP.

ETIOLOGY.—This is the most common and the most important of the congenital dislocations. It is more often unilateral than bilateral, and nearly 85 per cent. of the cases are in females.

The most reasonable theory of its etiology is pressure upon the flexed thigh, combined with laxity of the capsule or imperfect development of the acetabulum. The common form of displacement is upon the dorsum. In rare instances it may be upward or forward.

SYMPTOMS.—If the displacement is unilateral, the child limps from the time it begins to walk. The limp is a peculiar lunge, owing to the elasticity of the capsule that supports the head of the bone. There is also an abnormal lordosis and a tilting downward and forward of the pelvis on the side of the displacement.\* The actual shortening is at first slight, but it increases during growth as the head of the bone is gradually forced upward upon the pelvis. This actual shortening, which in adolescence varies from two to three inches, is often increased by an upward tilting of the pelvis, secondary to

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\* Explain the causes of these secondary distortions.

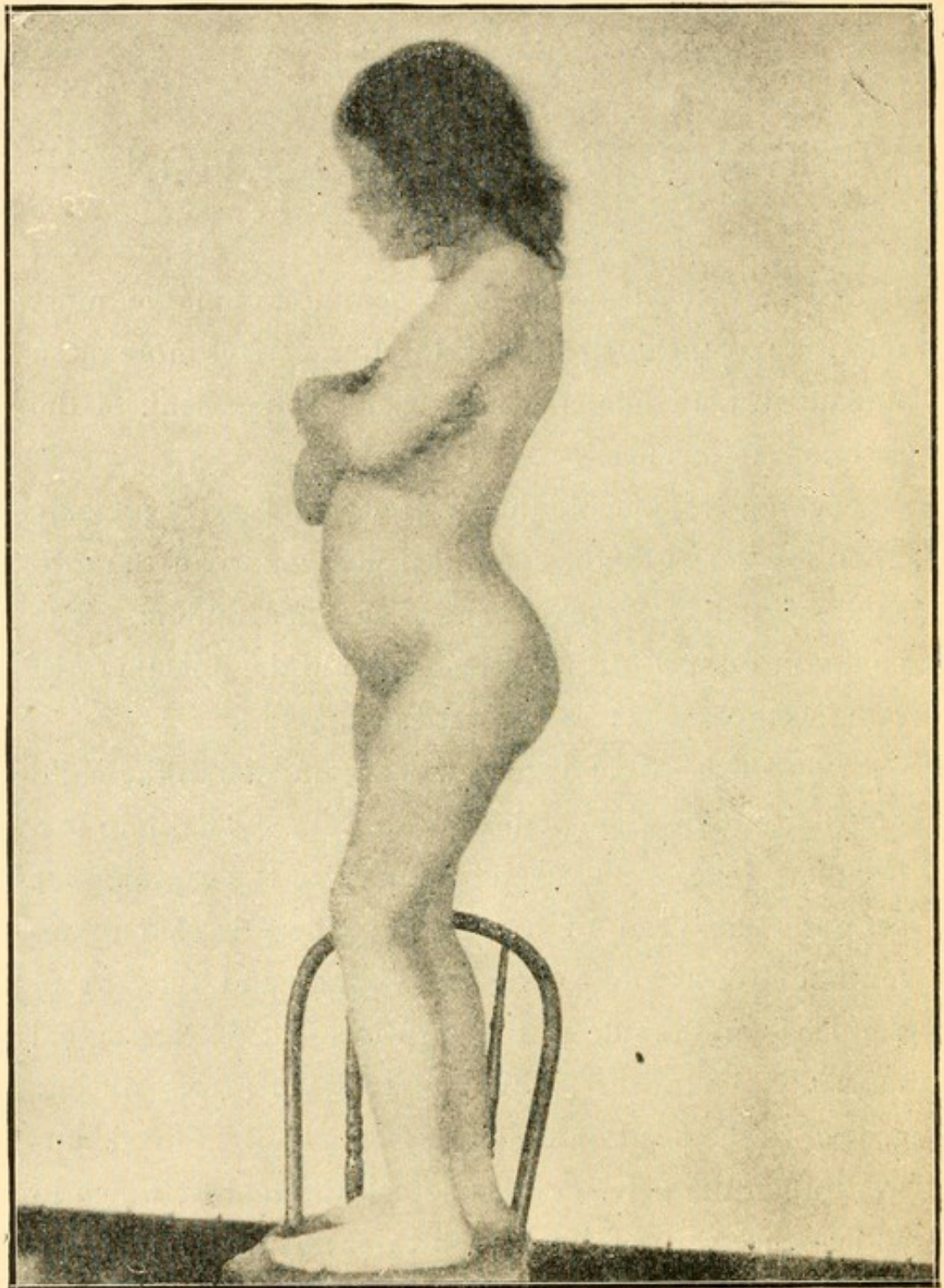


FIG. 44.—Double Congenital Dislocation of the Hip. (R. H. Sayre.)







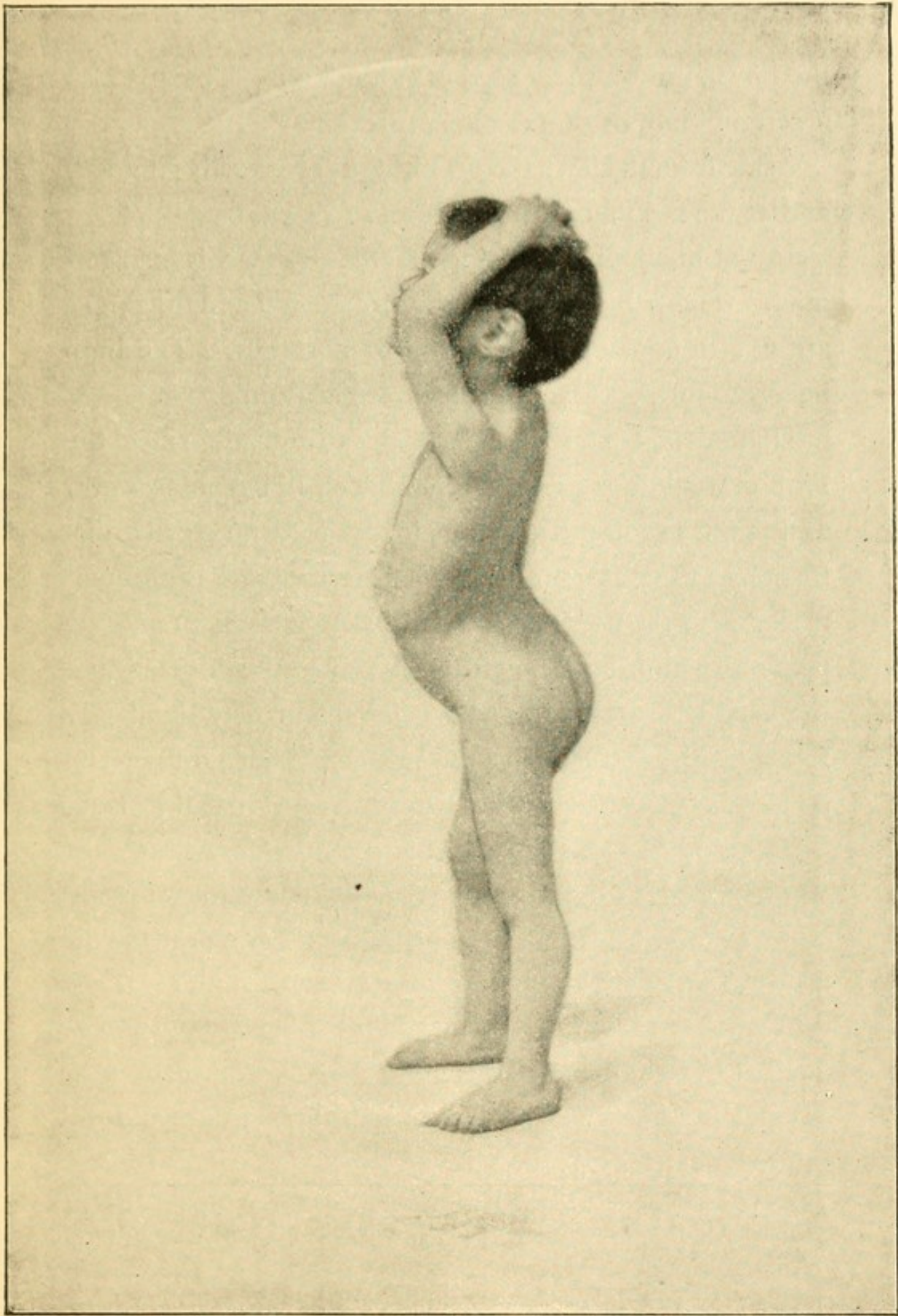


FIG. 45.—Congenital Dislocation of the Left Hip, showing the lordosis and the twist of the pelvis.

the limitation of the range of abduction. There is also a certain amount of permanent flexion. \*

Aside from the limp the patient usually is easily fatigued, and at times suffers from discomfort or pain.

In the bilateral displacements the lordosis is exaggerated. The pelvis is apparently broadened and the thighs are not in contact when the patient stands. The limp being doubled, as it were, becomes a waddle.

DIAGNOSIS.—The diagnosis is easily made, since the limp or waddle is present when the child begins to walk, and is not accompanied by pain, by paralysis, or by distortions of the extremities. The elevated and prominent trochanter may be demonstrated by measurement and by palpation, and if the thigh be flexed and adducted, the the head and neck of the displaced femur may be plainly felt beneath the tissues of the buttock. The differential diagnosis from coxa vara has been described in that section.

TREATMENT.—Replacement is the only treatment. In young subjects forcible replacement by traction, extreme abduction and flexion, with prolonged fixation in the attitude of extreme abduction, may be successful. †

If this treatment is unsuccessful, it may be supplemented by the open operation in which the capsule is opened and the rudimentary acetabulum enlarged to a sufficient capacity. ‡

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\* Mention primary or secondary deformities of the femur and pelvis.

† Whitman, *Pediatrics*, Nos. 9 and 10, 1898. The Lorenz Treatment of Congenital Dislocation of the Hip.

‡ Whitman, *Medical News*, October 7, 1899, and *Medical Record*, September 12, 1896. The Hoffa-Lorenz Treatment.









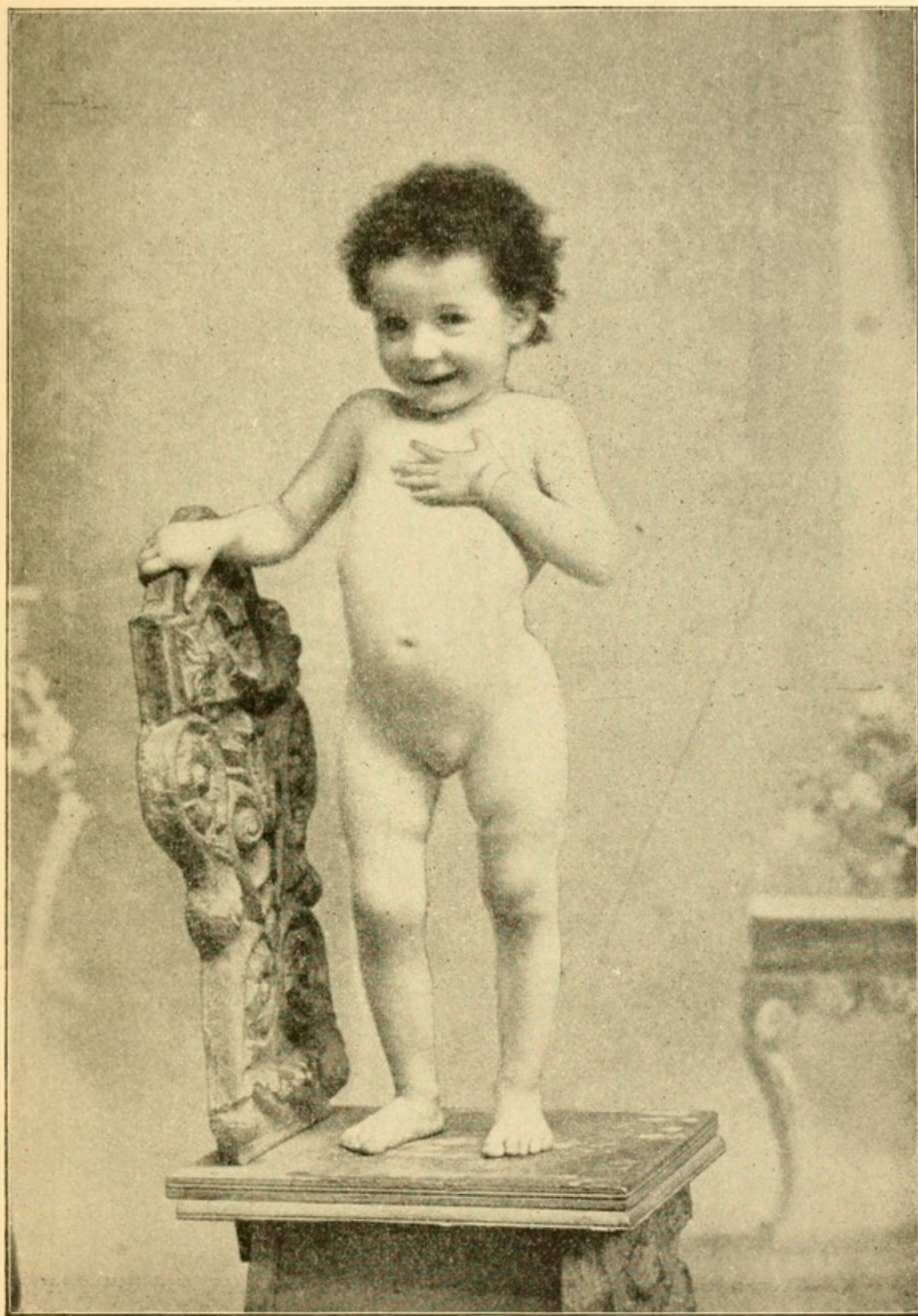


FIG. 46.—Bilateral Congenital Dislocation of the Hip, showing the separation of the thighs and the increased breadth of the pelvis.



## VIII. DEFORMITIES AND DISABILITIES OF THE FOOT.

### 1. TALIPES (CLUB-FOOT).

DEFINITIONS AND CLASSIFICATION.—Deformities of the foot are grouped under the generic name of **talipes** (from **talus**, ankle and **pes**, foot), signifying a form of deformity in which the patient walks upon his ankles. Talipes was originally synonymous with the term Club-Foot, but it is used now as a prefix to the descriptive titles of the different distortions, while club-foot is usually applied only to the most common of the congenital varieties, *i. e.*, equino-varus.

Deformities of the foot are abnormal fixations in normal attitudes or rather exaggerations of normal attitudes, the centres about which the foot is deformed being the normal centres of motion.

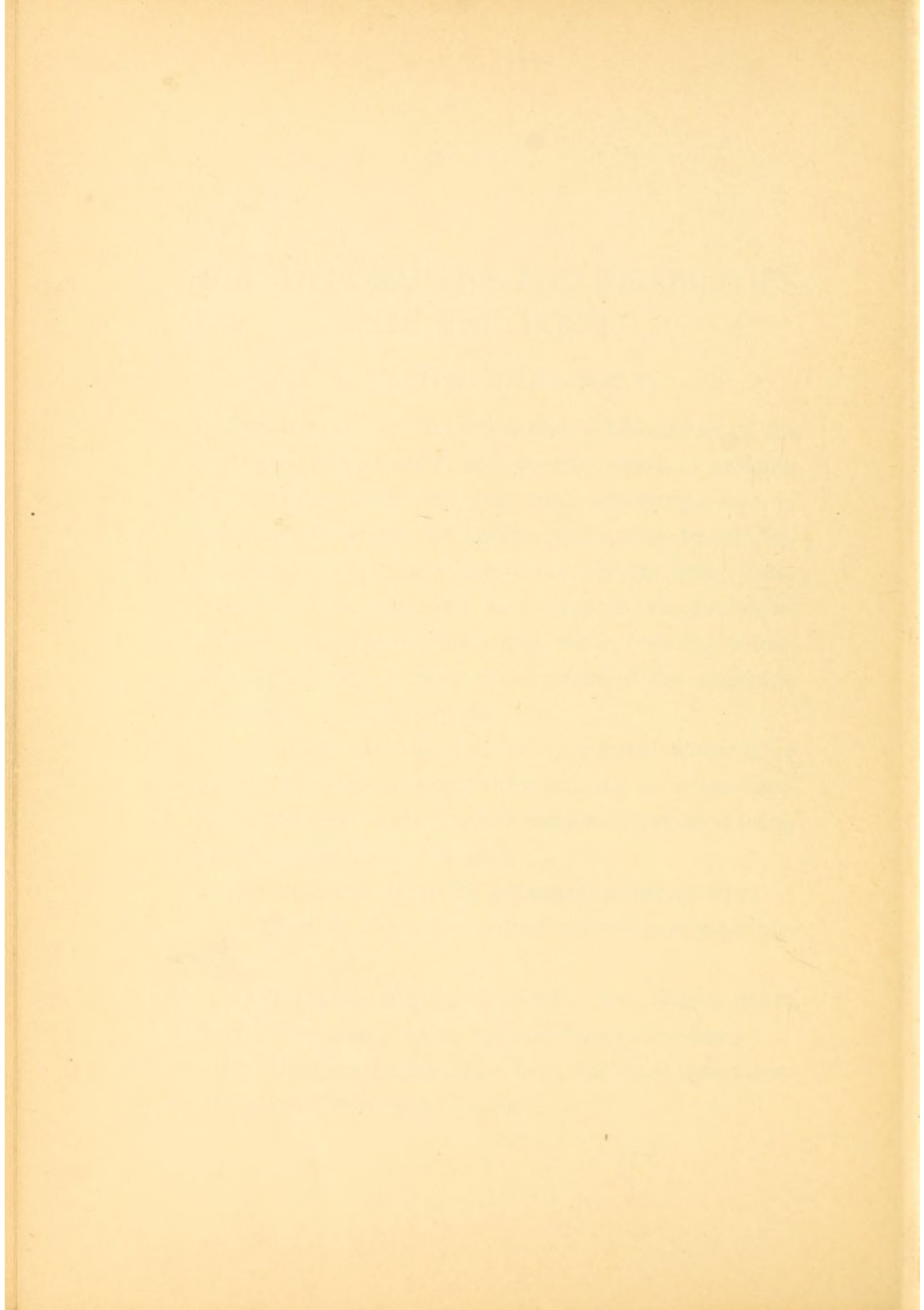
There are four simple or **primary deformities** :

1. Those in which the centre of motion is at the ankle-joint.

(*a*) **Talipes Equinus** (down), the plantar-flexed foot. The patient walks upon his toes (horse-like).

(*b*) **Talipes Calcaneus** (up), the dorsi-flexed foot. The patient walks upon his heel.





2. Those in which the centre of distortion is at the medio-tarsal and subastragaloid joints.

(a) **Talipes Varus** (in), the foot is turned inward in its relation to the leg; it is also supinated, the sole is inverted and the patient walks upon its outer border.

(b) **Talipes Valgus** (out), the foot is turned out-

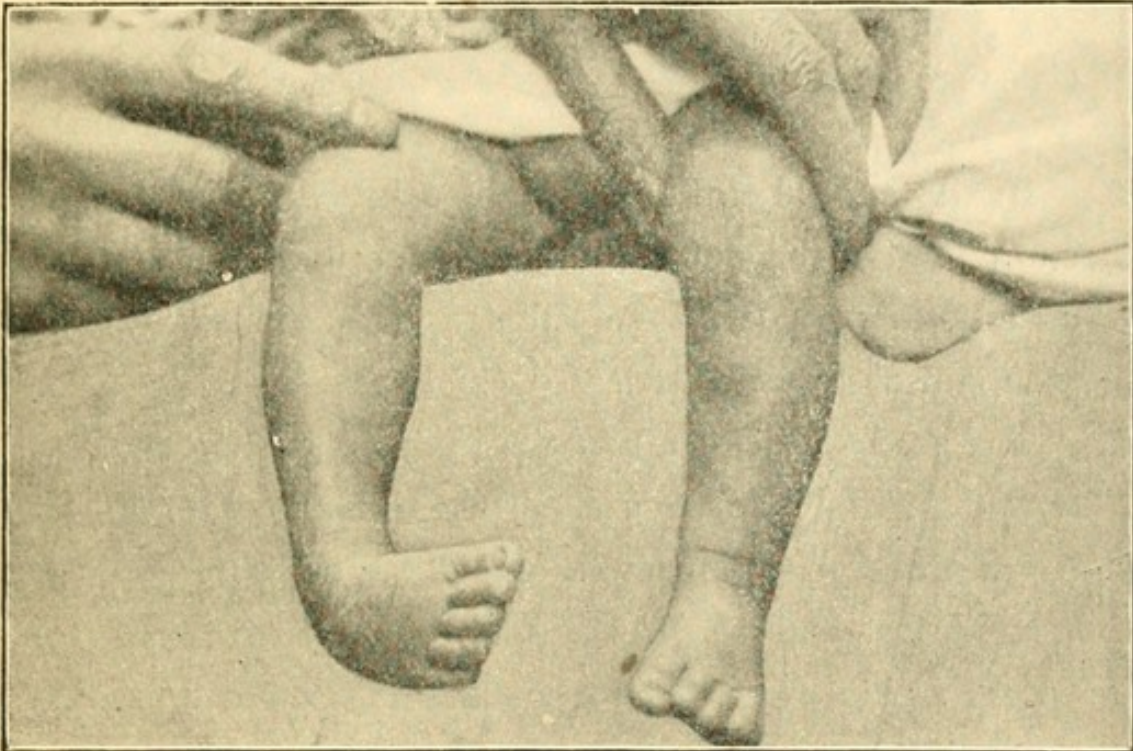


FIG. 47.—Congenital Equino-Varus.

ward and pronated; the sole is everted and the patient walks upon its inner border.

There are also two minor deformities, usually secondary to other distortions, which hardly merit the prefix of Talipes. These are:

**Pes Cavus**, in which the arch of the foot is exaggerated.

**Pes Planus**, in which the arch of the foot is depressed or lost.

The **primary** deformities may be, and usually are, combined, forming **compound deformities**, thus:

Equinus and  $\left\{ \begin{array}{l} \text{Varus: Equino-Varus (down and in)} \\ \text{or} \\ \text{Valgus: Equino-Valgus (down and out)} \end{array} \right.$

Calcaneus and  $\left\{ \begin{array}{l} \text{Varus: Calcaneo-Varus (up and in)} \\ \text{or} \\ \text{Valgus: Calcaneo-Valgus (up and out)} \end{array} \right.$

In the simple equinus, simple calcaneus, and in the compound varus deformities, the depth of the arch is usually increased; in the valgus and equino-valgus the arch is usually decreased.\*

The grade of deformity varies in individual cases. The term **talipes** is often applied when the range of motion is but moderately restricted, and when the attitude of the foot varies but slightly from the normal. **Slight equinus**, for example, implies an inability to dorsi-flex the foot to a right angle.

### The Normal Range of Motion of the Foot:—

**Dorsal flexion** to 70–80 degrees.

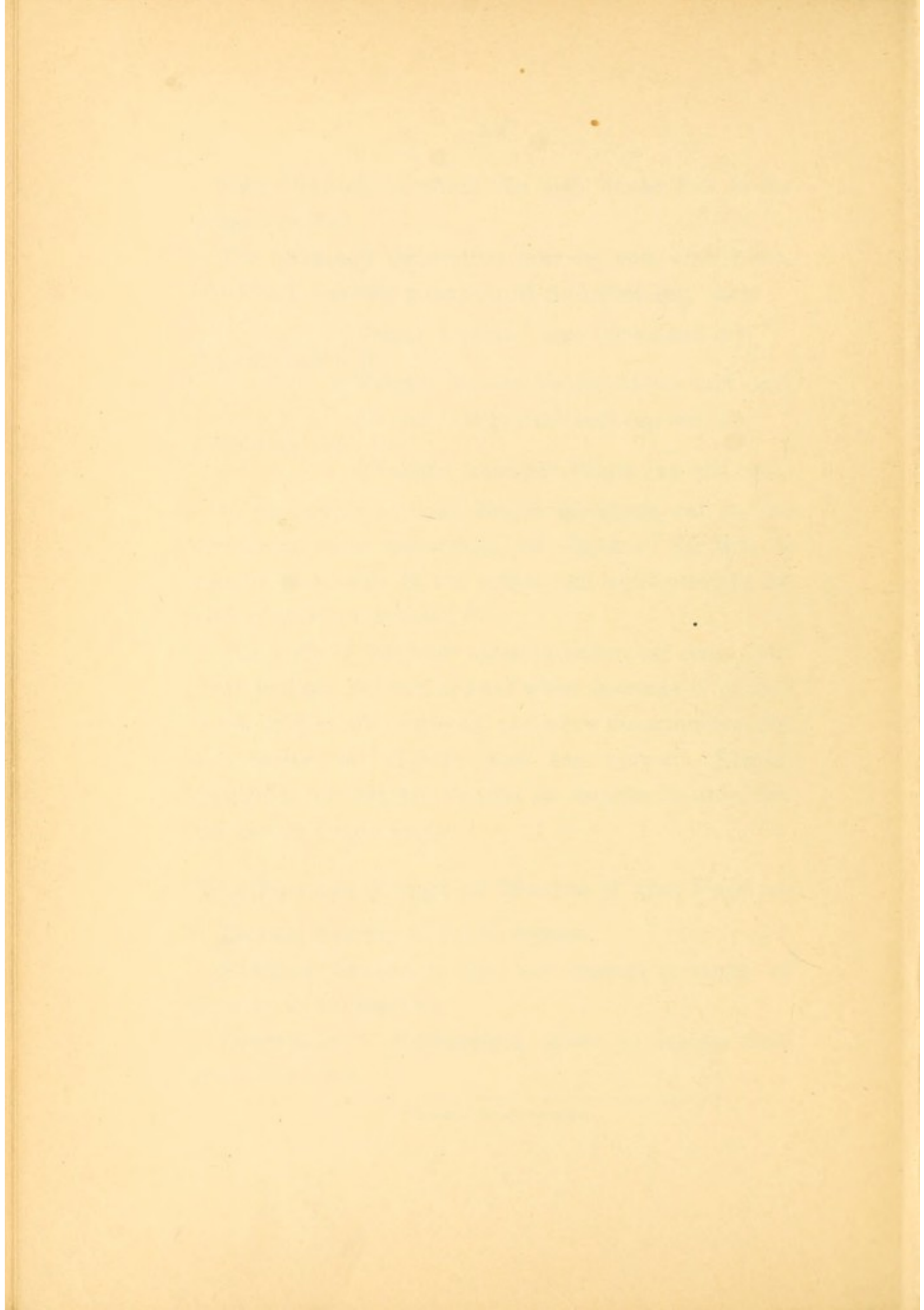
**Plantar flexion** to 130–140 degrees (a range of from 50 to 60 degrees).

**Inversion or Adduction**, about 30 degrees from the median line.

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\* Explain the mechanism.





**Eversion or Abduction**, about 20 degrees from the median line (a range of about 50 degrees).

ETIOLOGY.—Distortions of the foot are divided as to etiology into two classes:

- (a) The congenital,
- (b) The acquired.

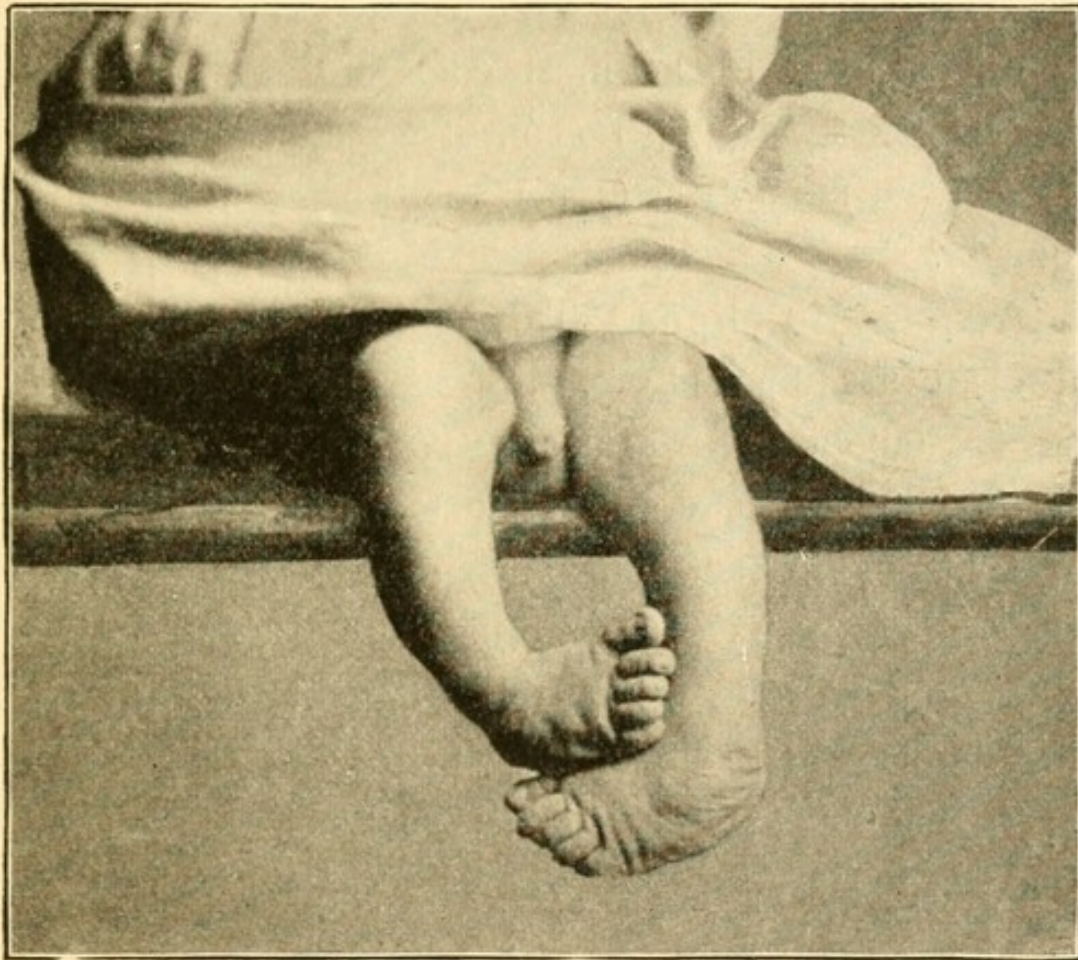


FIG. 48.—Double Congenital Talipes Equino-Varus.

**Congenital distortions** are, as a rule, due to abnormal restraint or fixation of the foot for a longer or shorter time before birth.\*

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\*Exceptional cases? Other theories?



STATISTICS.—\*Congenital talipes is far more common in males than in females (65 per cent. in males to 35 per cent. in females). One foot is more often deformed than both (47 per cent. unilateral, 43 per cent. bilateral). The right foot is somewhat more often affected than the left (31 per cent. right foot, 27 per cent. left foot).

Equino-varus is the most common form of congenital distortion (77 per cent. of all the cases), valgus (7 per cent.) and varus (5 per cent.) being next in frequency.

**Acquired Talipes.**—This form of distortion is, as a rule, caused by paralysis, most often by anterior poliomyelitis (about 82 per cent.); 11 per cent. are secondary to cerebral palsy, and 5 per cent. to trauma.

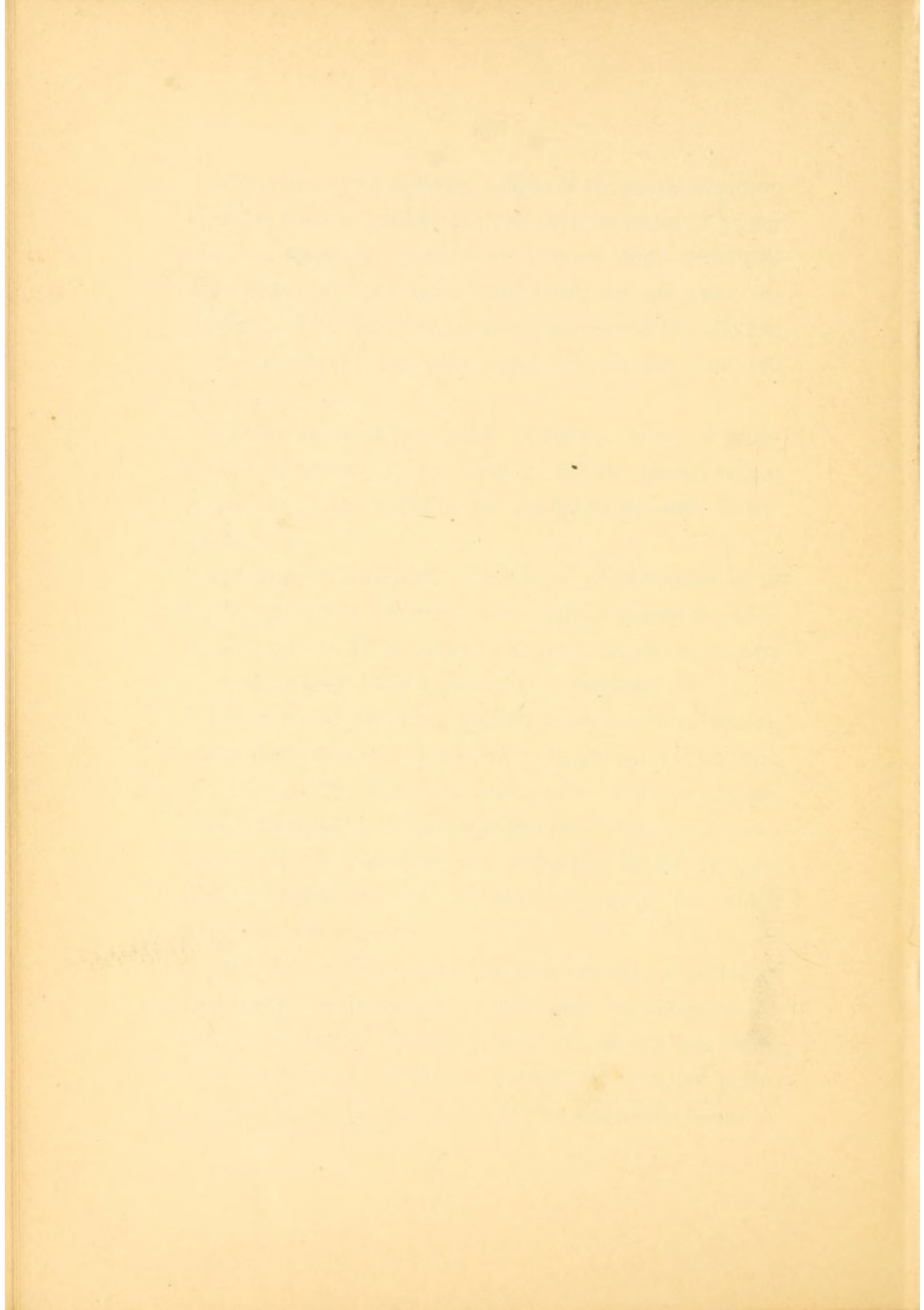
Acquired talipes is but slightly more common among males than females (54 per cent. to 46 per cent.), and the deformity is, as a rule, confined to one foot (85 per cent. unilateral). This statement does not imply, however, that the paralysis was originally limited to one limb; it refers only to the final deformity, for which treatment was required.

The deformities caused by paralysis are, in order of frequency, equino-varus, 32 per cent.; equinus, 26 per cent.; calcaneus, 12 per cent.; valgus, 10 per cent. The mechanism of talipes, caused by anterior polio-

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\*These statistics have been obtained from the records of the Hospital for the Ruptured and Crippled.





myelitis, is somewhat as follows: As the anterior muscles are more often involved, the foot drops and falls to one side or the other, according to the distribution of the paralysis. The muscular power is unbalanced, and the power that is retained tends to distort the foot. This primary distortion is increased by the use of the member in the deformed attitude, and it is confirmed by the secondary shortening of the muscles and by the adaptive changes in the internal structure.

The mechanism of cerebral palsy,\* of trauma and the like, is, of course, very different.

The effect of the acquired deformities of the foot, due to anterior poliomyelitis, upon the gait varies greatly. If, for example, the anterior group is paralyzed, the foot dangles, but if this finally becomes a fixed equinus deformity, it is, although a somewhat awkward, yet an efficient, member. If, however, the calf muscle is paralyzed, the propelling force is taken away and the patient walks heavily on the heel. He is, as it were, "hamstrung," and the foot is useless, except as a simple support.

TREATMENT.—It may be stated generally that congenital talipes may be cured in almost every case by proper treatment. Acquired talipes can be prevented or corrected, but, in many instances, it can not be cured. †

\*Mention the abductors and adductors of the foot.  
Describe the common variety of deformity of this class.

†Explain the reason for this.

Thus the prognosis, as well as the treatment, depends upon the etiology of the deformity.

**Treatment of Congenital Equino-Varus** (Club-foot).—As soon as the deformity is discovered, treatment should be begun. The foot having grown into deformity during intra-uterine life, must be made to grow out of deformity before locomotion is begun; and, since the deformity affects every component part of the foot, every part must be considered in its correction.\*

The aim in the treatment is:

1. To overcome restriction of motion in every direction.
2. To hold the foot in proper position until its internal structure shall have become transformed.
3. To protect and to stimulate the weakened muscular groups until the balance of the foot has been regained.

**Treatment of Infantile Equino-Varus** (Club-foot.)—The aim should be to correct the varus before considering the equinus. Thus, the foot should be drawn gently outward or toward abduction until the infant shows evidence of discomfort; it should then be fixed in the improved position.

A convenient appliance for this purpose is a very light plaster bandage put over a smooth flannel bandage. This bandage is removed at the end of a week, and the foot, having been still further corrected, is again fixed. At

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\*Describe the more important structures that are contracted. What bones are distorted to a marked degree?





the fourth application it is often possible to hold the foot in an attitude of extreme valgus, although in resistant case a much longer time may be required. When the varus deformity has been over-corrected, the same process is repeated in the correction of the equinus, and one should not be content until the dorsum of the foot may be pushed almost into contact with the tibia. This completes the first stage of treatment, in that the deformity has been corrected and in that the range of passive motion has been regained. But as the muscles, particularly the flexor and abductor groups, are weak, the foot must be supported in the normal posture, and the muscles must be stimulated by massage, and by functional use in the normal directions. Thus, a brace is usually necessary in the after-treatment. When the child begins to walk, the cure is completed by natural means, if the weight of the body falls properly on the feet.

As a rule, no operation other than division of the tendo Achillis is required when early and persistent treatment has been employed.

**Club-foot in walking children** should be treated by immediate correction of the deformity. One of the simplest and most efficient operations is that of forcible manual correction under anæsthesia, combined with tenotomy of the more resistant tissues. The foot is afterward fixed in the over-corrected position\* in a

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\*How long should the position of over-correction be maintained?

How long is supervision required?

How may the range of motion be maintained?



plaster bandage, on which the patient is encouraged to walk.\*

**Persistent club-foot in older subjects**† often requires more extensive operations. For example, the Phelps operation, an open division of all the contracted parts on the inner border of the foot. Cuneiform osteotomy or astragalectomy are other examples of such operations.

Other varieties of congenital talipes are of comparatively slight importance. The principles of treatment have been indicated.

**Treatment of Acquired Talipes.**—As has been stated, it is possible to prevent the development of paralytic talipes by supporting the foot in normal position.

The deformity of acquired talipes is not, as a rule, resistant, and it may be readily corrected by tenotomy and by slight force. When the deformity has been corrected, the foot must be supported in the proper position by a brace if the paralysis persists.

Operative treatment may be required when other measures fail. The operations used are:

1. **Tendon Transplantation.**—This is a redistribution of the muscular power that remains, by splitting the tendons of one or more of the active muscles and

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\*Why should the patient be asked to walk on the corrected foot?

†Whitman, New York *Polyclinic*, September 15, 1896. The treatment of so-called relapsed club-foot.





attaching one section to the tendon of the paralyzed muscle or muscles.

2. **Arthrodesis.**—For the purpose of producing ankylosis.

3. **Astragalectomy, Cuneiform Osteotomy,** or other operative procedures, are occasionally required to correct deformity of long standing.

## 2. WEAK FOOT OR FLAT FOOT.

The weak foot is one in which the attitude of rest or of inactivity persists.\* In the attitude of rest, as when the patient supports his weight upon one limb, the leg is rotated inward, and the foot is turned outward. The astragalus supporting the leg is rotated inward and downward upon the os calcis; thus the weight of the body falls upon the internal border of the foot, and it is supported, in great degree, by the ligaments. The arch of the foot is somewhat lowered, and the concavity of its inner border is replaced by a bulging inward. The weak and so-called flat foot should be considered as an exaggeration of this attitude of abduction or pronation in which the lowering of the arch, that gives the deformity its popular name, is but one of the symptoms and effects.

As has been stated, the deformity of the weak foot is

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\* Whitman—"A Study of the Weak Foot," *New York Medical Journal*, November 9 and 16, 1895; *Boston Medical and Surgical Journal*, June 14 and 21, 1888.

simply a persistence and usually an exaggeration of this passive attitude, which, although normal when the foot serves to support weight, is abnormal when it should be used as an aid in propelling the body. This abnormal use of the feet, in which they are swung along in the everted attitude in a gait in which grace and elasticity are wanting, is common among those who are free from disability, but it is an attitude that subjects the feet to mechanical disadvantages, and it is therefore one of the important predisposing causes of disability.

Another of the more important indirect causes of deformity and weakness is the use of improper shoes, by which the foot is compressed and distorted. It is needless to mention all the causes of a deformity which may be the result of local weakness or of excessive burden or strain to which the part may be subjected. In general, local weakness may be the result of gout or rheumatism or injury, while the foot may be overburdened by excessive bodily weight or by occupations that require long standing. In childhood the predisposition to deformity may be inherited, or it may be acquired, rachitis being one of the more direct causes of the disability.

**SYMPTOMS.**—These are, in the early stage, characteristic of over-strain and weakness. The patient complains of a tired feeling, of heaviness and discomfort, referred to the inner border of the foot, to the ankle and





to the heel. This discomfort may be increased to actual pain by over-strain or over-use. As the disability progresses, the patient complains of stiffness after sitting for a time, and often of severe pain and local sensitiveness, accompanied by swelling about the ankle and medio-tarsal articulation.

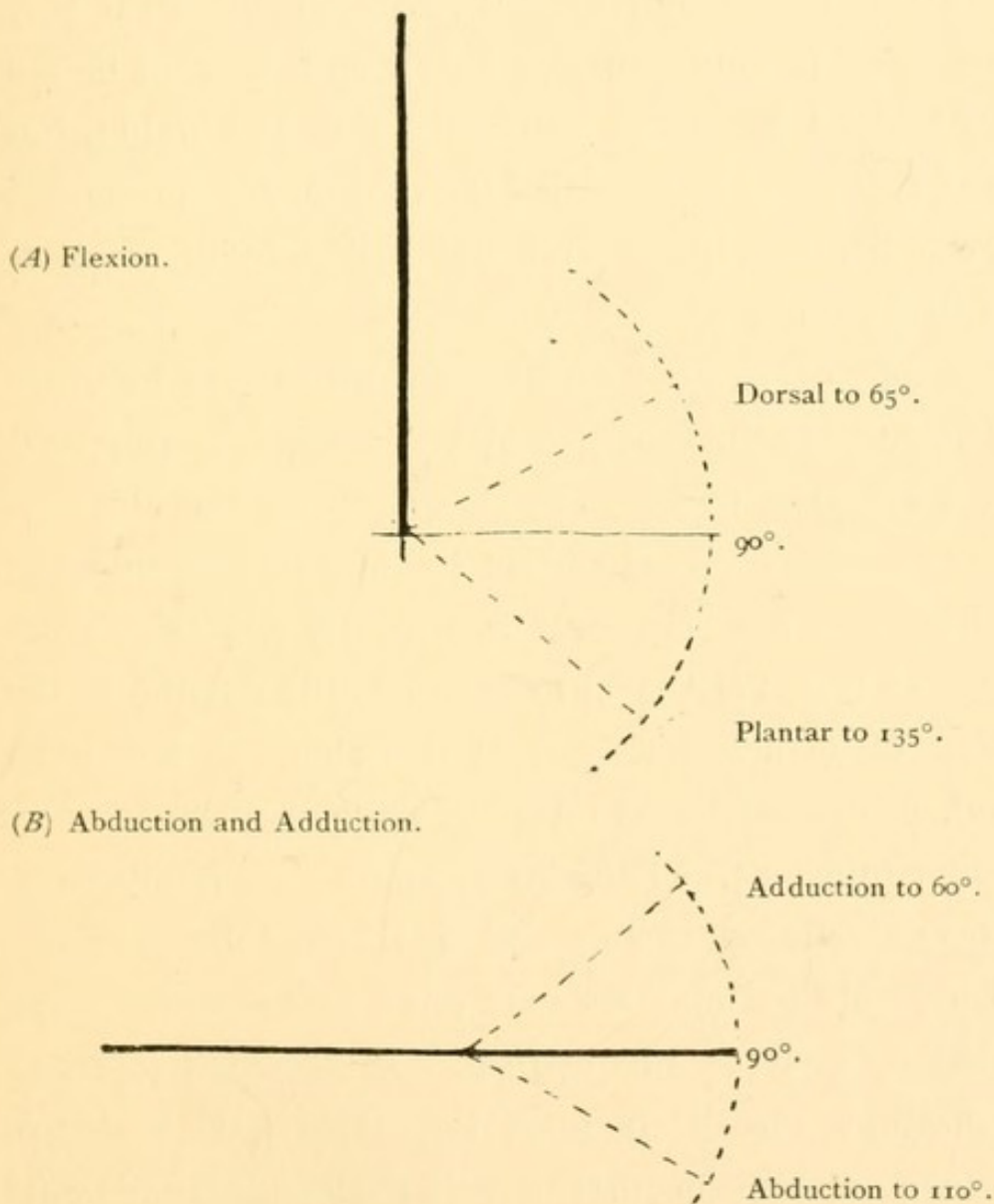


FIG. 49.—Range of Motion of the Foot.



EXAMINATION.—The patient usually walks with a heavy, springless gait, the feet being turned outward. The soles of the shoes are usually somewhat worn away on the inner border and bulge inward. As the patient stands, it will be noted that the weight falls on the inner side of the foot and that the line of strain that should pass across the second toe falls inside of the great toe. There is a prominence just below and in front of the inner malleolus, and, as a rule, the arch is lowered, but all the symptoms of so-called flat-foot may be present in a severe degree with an arch which is actually exaggerated in depth.

For this reason the term flat-foot, which may be properly applied to the foot in which the arch is simply low, is a misleading term. The symptoms in the affection under consideration are caused by the breaking down of the foot, and not because it is, properly speaking, a flat foot. In fact, these symptoms bear little relation to the degree of actual deformity, but rather, as has been stated, to the strain and injury to which a weakened foot is being subjected. Thus the symptoms are remittent in character, relieved by rest and aggravated by over-use, and on this account they are often mistaken for those caused by gout or rheumatism. In the early stages of the disability one of the most important tests is that of the range of motion, that of voluntary adduction being almost invariably restricted; and if the symptoms are at





all acute the foot may be practically fixed in the attitude of abduction by muscular spasm and retraction. The astragalo-scapoid articulation just in front of the internal malleolus is usually sensitive, and pressure at this point, combined with a sudden movement of the foot towards adduction, will almost invariably cause discom-

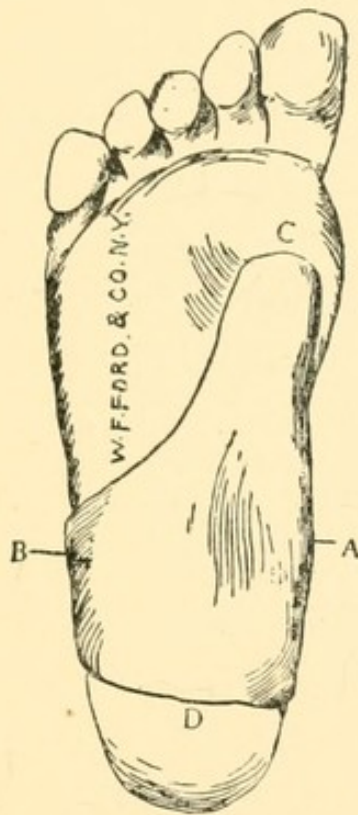


FIG. 50.—Brace for Weak Foot.

fort. In advanced cases nutritive changes are present, due largely to disease, for example, atrophy of the calf, congestion and excessive perspiration of the foot.

Weak foot is common in childhood, but pain and restriction of motion are much less marked, because the strain to which the foot is subjected is comparatively slight.

At this age attention is often called to the disability by a symptomatic in-toeing gait (pigeon-toe), which is evidently a conservative effort of nature to protect the weak part. The same symptomatic attitude may also accompany knock-knee.

TREATMENT.—The principles of treatment are simple. Restriction of motion and deformity must be overcome, and muscular spasm and pain must be relieved.

If the deformity is of long standing, and if muscular spasm and retraction are present, forcible manipulation under anæsthesia to the extremes of normal motion is indicated. This is followed by fixation by means of a plaster of Paris bandage in the attitude of extreme adduction. These measures constitute the preliminary treatment.

In all cases in which the weakness is at all marked the foot must be supported in the normal attitude by a proper brace.

A proper shoe must be worn, of which the heel and sole should be raised somewhat along the inner side in order to tilt the foot slightly towards the attitude of adduction. The normal gait, with the feet practically parallel, should be acquired by practice, and finally the weakened adductor group must be strengthened by appropriate exercises. Under favorable conditions flat-foot (so-called) is a curable deformity, and in nearly every case comfort may be assured by rational treatment.











**Shoes.**—The proper shoe deserves brief mention. A shoe, being intended to support the foot and to protect it, should conform strictly to the normal outline of an undistorted foot. Its sole should be straight on its inner border and somewhat wider than the sole of the foot. It should not be rocker-shaped, but flat, and the upper part should be of sufficient capacity to allow perfect freedom for the toes.\*

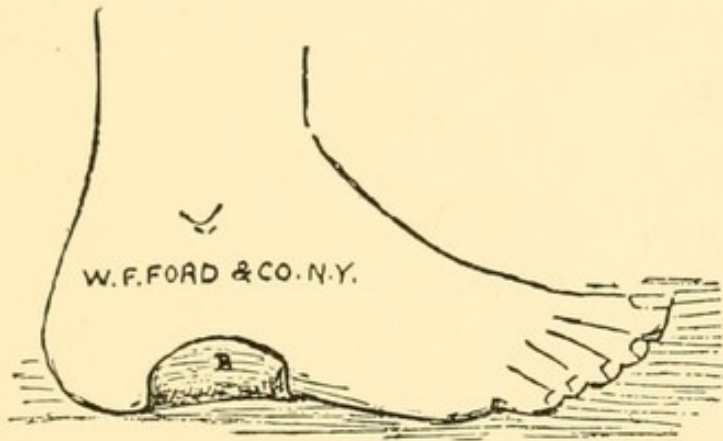


FIG. 51.—Brace for Weak Foot. Lateral aspect.

### 3. PES CAVUS OR HOLLOW FOOT.

**DEFINITION.**—This is a deformity of the foot characterized by an increased concavity of the longitudinal arch, and an increased convexity of the dorsum. The term *pes cavus* is used in any case where the arch of the foot is increased.

**CAUSES.**—The simple exaggerated arch may be a congenital deformity. The depth of the arch may be increased by the use of high heels, but the affection is

\*Whitman, *Medical News*, Aug. 14, 1897—"Practical Remarks on Shoes."

most often caused by temporary weakness or paresis of the anterior tibial group of muscles; for example, as a sequel of exanthemata.

The hollow foot is usually a somewhat inelastic foot, and greater pressure is brought to bear upon the two supports of the arch, the heel and the ball of the foot. As a consequence, there are often corns or callosities beneath the anterior metatarsal arch, and neuralgic pain referred to the contracted plantar fascia is not infrequent. The ankles are also weak, "turn easily" and thus symptoms of the weak foot, that is, of strain at the medio-tarsal joint, are not infrequently present.

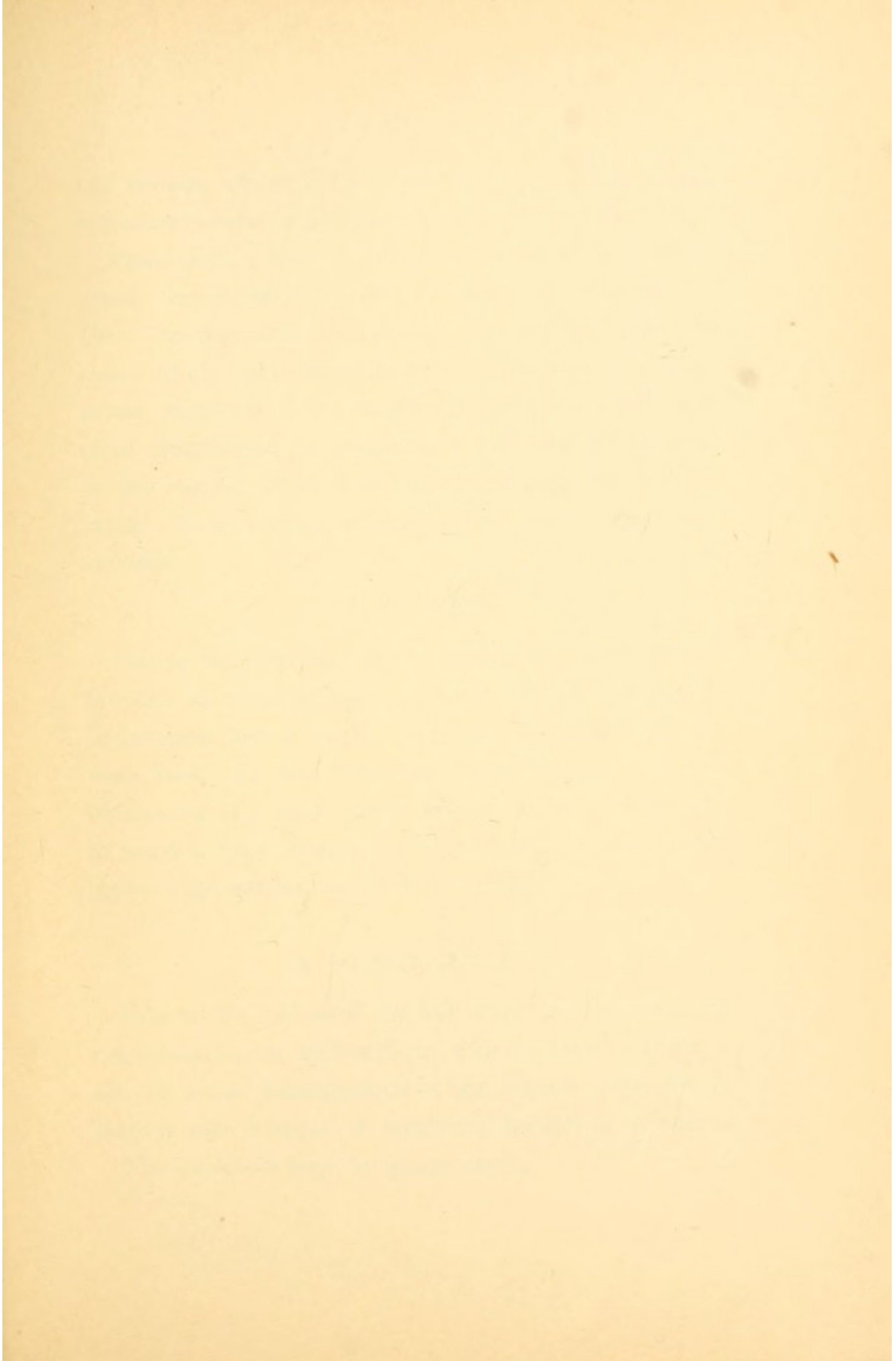
TREATMENT.—A shoe with a high arch, broad, thick sole and low wide heel is often sufficient in the slight cases. If the deformity be more pronounced, division of the contracted parts and correction of the deformity is indicated.

#### 4. ACHILLODYNIA.

Achillodynia is a term first applied by Albert to inflammation of the small bursa lying between the tendo Achillis and the os calcis.

CAUSES.—The common causes of the affection are strains, injuries and pressure; chronic inflammation may be a sequel of gonorrhœa, rheumatism or an infectious disease.

SYMPTOMS.—These are pain at the heel whenever the





calf muscles are in action, usually some local swelling, and sensitiveness to pressure on either side of the heel.

TREATMENT.—Rest is indicated in the acute cases in which the cause is trauma. If necessary, a plaster of Paris bandage may be applied. In chronic cases removal of the bursa is indicated, together with the appropriate treatment of the exciting cause. The affection is often complicated by weakness of the longitudinal arch of the foot, of which achillodynia may be the indirect cause. In such cases an appropriate support should be applied.

#### 5. HEEL PAIN.

Pain in the bottom of the heel may be caused by the pressure of constant standing which bruises the tissues underneath the os calcis. It is also a symptom of the weak foot. In rare instances it may be due to an inflammation of a small bursa beneath the inner tuberosity in which a nerve filament is implicated. In the latter instance its removal would be indicated.

#### 6. PLANTALGIA.

Pain in the hollow of the foot may be a symptom of the contracted or hollow foot, or of flat foot. There is also an actual inflammation of the plantar fascia which is most often a sequel of infectious diseases or of injury.

The treatment must be symptomatic.

7. ANTERIOR METATARSALGIA—(Morton's Neuralgia.\* Depression of the Anterior Metatarsal Arch.)

Anterior Metatarsalgia is a neuralgic pain referred to the metatarso-phalangeal articulation ; most often to the fourth. †

It is caused by a weakness of the supports of the anterior metatarsal arch which allows one or more of the articulations to sink below the level of its fellows, a position that exposes it to greater pressure from the sole of the shoe and to lateral pressure as well. Thus, in most instances, the patient complains of a sensitive point beneath the articulation and of sharp neuralgic pain radiating from the joint when the sensitive part is "pinched." At such times the pain is so severe, that the patient is obliged to remove the shoe, and this, together with the fact that the pain is almost never experienced except when the shoe is worn, is the characteristic point in the history. In confirmed cases the spasms of pain may be very frequent, increased possibly by neuritis of nerve fibres that are implicated. All the symptoms are aggravated by depression of the general health and by those diseases that may increase the local sensitiveness of the foot, as, for example, gout or rheumatism.

The weakness that predisposes to the affection may be inherited, but it is usually induced by improper shoes.

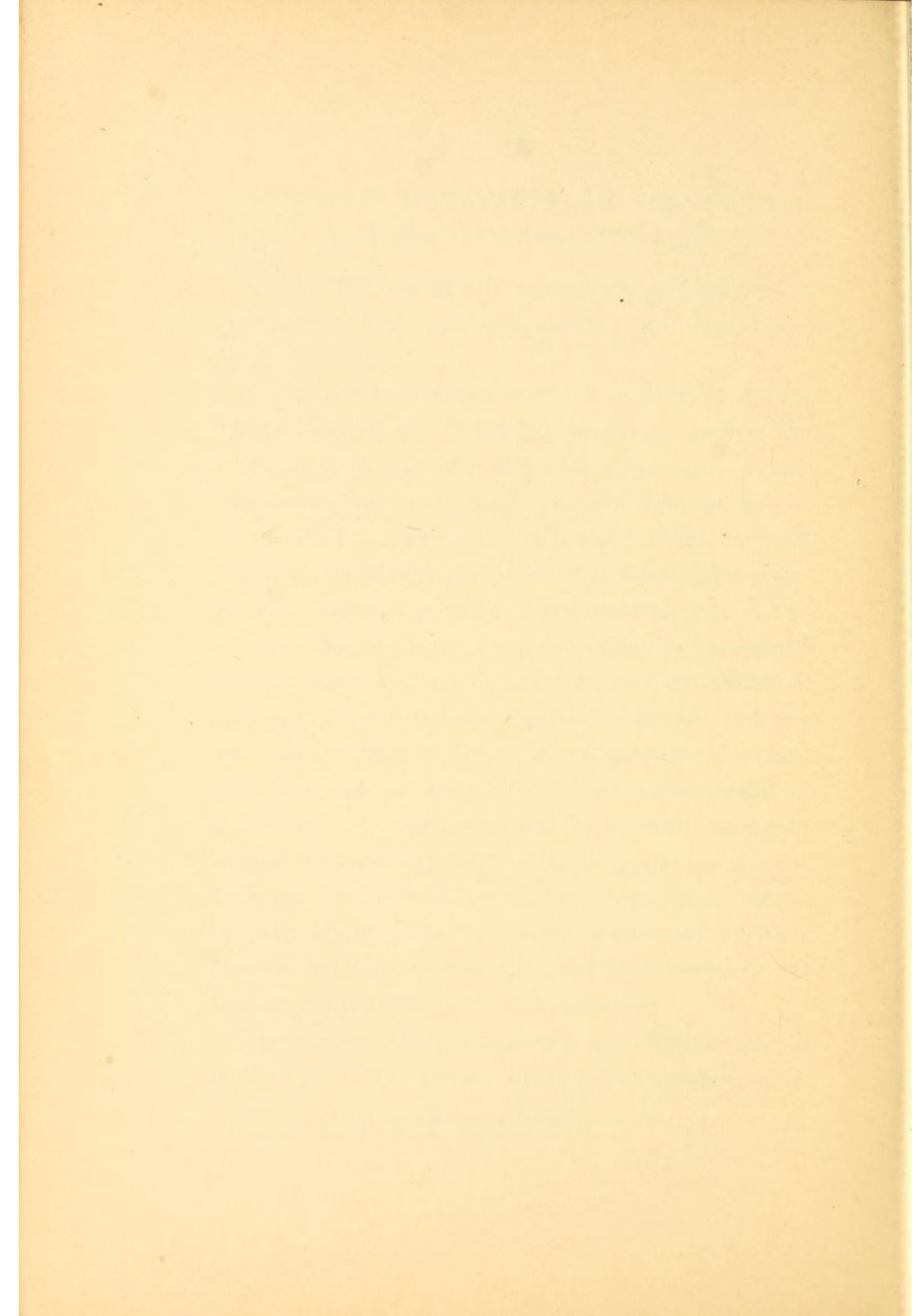
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\* First described by T. G. Morton of Philadelphia in 1876.

† Whitman, *Medical Record*, August 6, 1898.







The exciting cause may be strain or injury. The affection may be combined either with the contracted foot, or with the weak or flat foot.

The pain may be only occasional, as when an ill-fitting shoe is worn, but it may be constant and disabling. As a rule, both feet are affected to a greater or less extent in chronic cases.

TREATMENT.—If deformity or other weakness of the foot be present, it should receive attention. A proper shoe with a high arch, low heel, and thick, broad sole should be provided. This sole should be arched somewhat beneath the metatarsal arch, or preferably a metallic brace may be used for the purpose of supporting the front of the foot and protecting the depression that induces the symptoms. As a temporary expedient, a small pad may be fixed to the sole, just behind the sensitive joint by adhesive plaster, which may, with advantage, encircle the entire metatarsal region.

In the severe and persistent cases resection of the affected articulation may be indicated.

## 8. HALLUX VARUS AND PIGEON TOE.

Hallux Varus, the adducted great toe, is sometimes seen as a congenital condition; or it may be part of a slight varus deformity. It is one of the varieties of so-called pigeon toe.

**Pigeon Toe.**—This term is applied to the in-toeing walk. Pigeon toes in young children are almost always symptomatic of weakness of the arch of the foot, or of knock-knees. Thus it is a conservative effort of nature to check deformity, and it should be treated by remedying the condition of which it is a symptom.

In other instances it may be caused by bow-legs, or it may remain after club-foot. In rare instances it may be a congenital peculiarity.

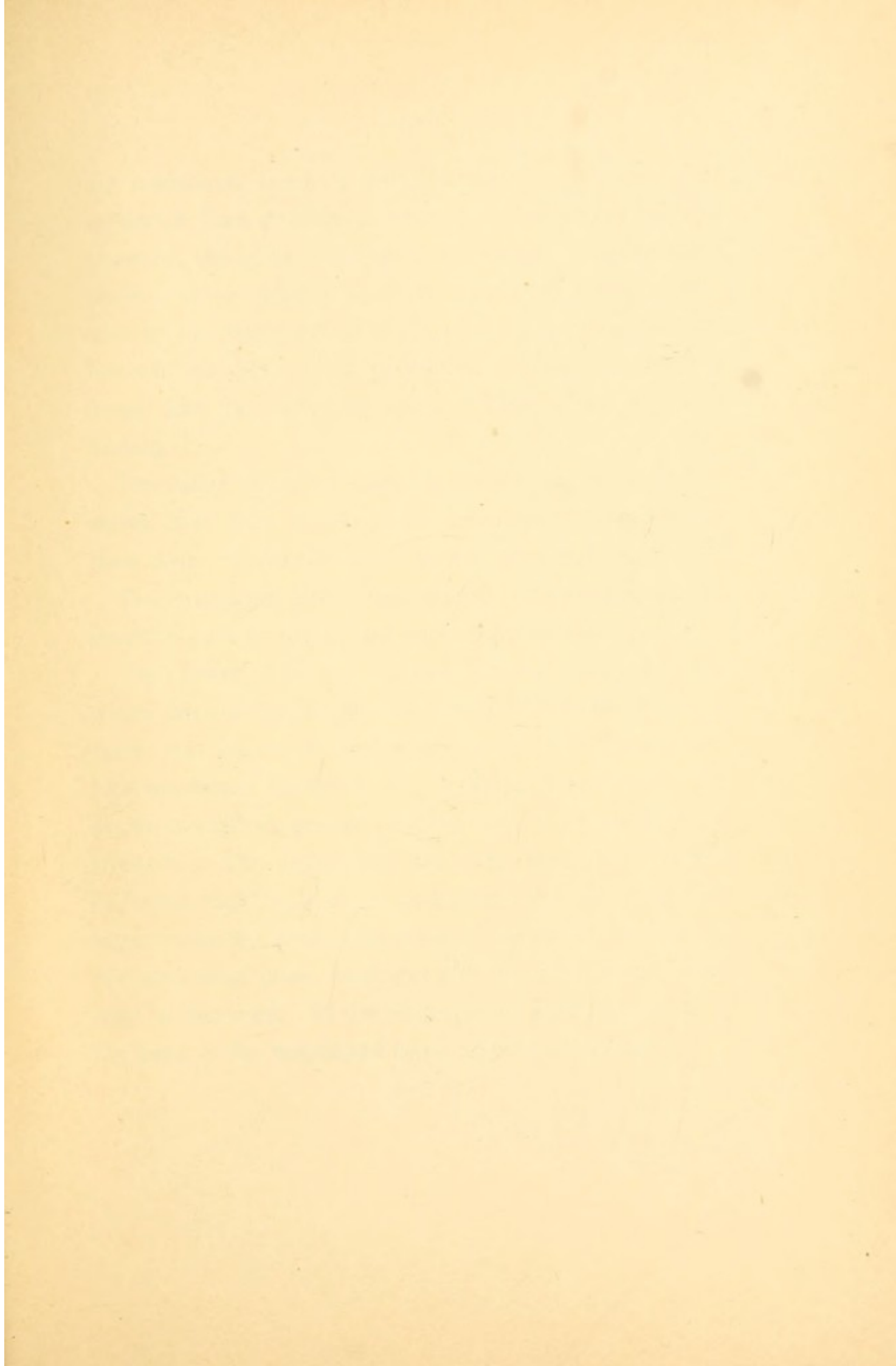
#### 9. HAMMER TOE.

Hammer toe is a deformity of the toe, usually of the second, characterized by dorsi-flexion of the first phalanx, plantar flexion of the second, while the third may be either flexed or extended. Thus the flexed toe is subjected below to the pressure of the sole of the shoe, and its dorsal surface to the pressure of the upper leather. At this latter point at the junction of the two phalanges, a corn or bunion forms. The symptoms are due to the pressure on the painful parts. Hammer toe may be a congenital deformity, but it is usually the result of improper shoes.

**TREATMENT.**—Resection of the joint between the first and second phalanges is the most effective treatment of the severe cases.

#### 10. HALLUX VALGUS.

Hallux Valgus is an outward deviation of the great toe from its normal line. In well-marked cases the head of





the metatarsal bone is displaced inward or somewhat separated from its fellows, while the phalanx is displaced outward, the joint forming a convexity. The internal portion of the head of the first metatarsal bone, uncovered by the displacement of the phalanx, projects sharply beneath the skin. This projection is often covered by a bursa and by calloused skin. This is the so-called bunion.

The cause of hallux valgus is the wearing of improper shoes, thus it is usually more common among women than men. It may be secondary to gout or rheumatism.

The symptoms are those caused by pressure on the sensitive corn or callus and underlying bunion.

TREATMENT.—In the milder cases a proper shoe, which assures the removal of pressure from the sensitive point will relieve the symptoms, and the deformity will to some extent correct itself. If the toe be methodically drawn toward its proper position, and if its muscles be strengthened by appropriate exercises, the correction will be more rapid and more complete. In the more extreme cases the projecting internal surface of the head of the metatarsal bone, together with the over-lying bursa, may be removed. If the deformity be great, resection of the head of the metatarsal bone may be indicated.

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### C. FRENCH.

**Revue D'Orthopédie**, paraissant tous les deux mois sous la direction de M. le Dr. Kirmisson, Paris, Masson et Cie.





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**Bulletins de la Société Anatomique de Paris**, redigés par M.M. Macaigne et Vermorel, Paris; Steinhil.

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## X. GLOSSARY.

(List of the Principal Technical Terms Employed in Orthopædic Surgery.)

ABBREVIATIONS: *Gr.*, Greek; *Lat.*, Latin; *Fr.*, French; <, derived from; +, and.

ANKYLOSIS.—(< Gr. *ankylo*, crooked, + *osis*, condition.) Stiff joint. Also written *anchylosis*.

ANKYLOPHOBIA.—(< Gr. *ankylo*, crooked, + *phobia*, fear.) Fear of ankylosis on the part of a surgeon.

ARTHRECTOMY.—(< Gr. *arthron*, joint, + *ectome*, excision.) Erasion of a joint, *i. e.*, removal of the morbid structures contained therein.

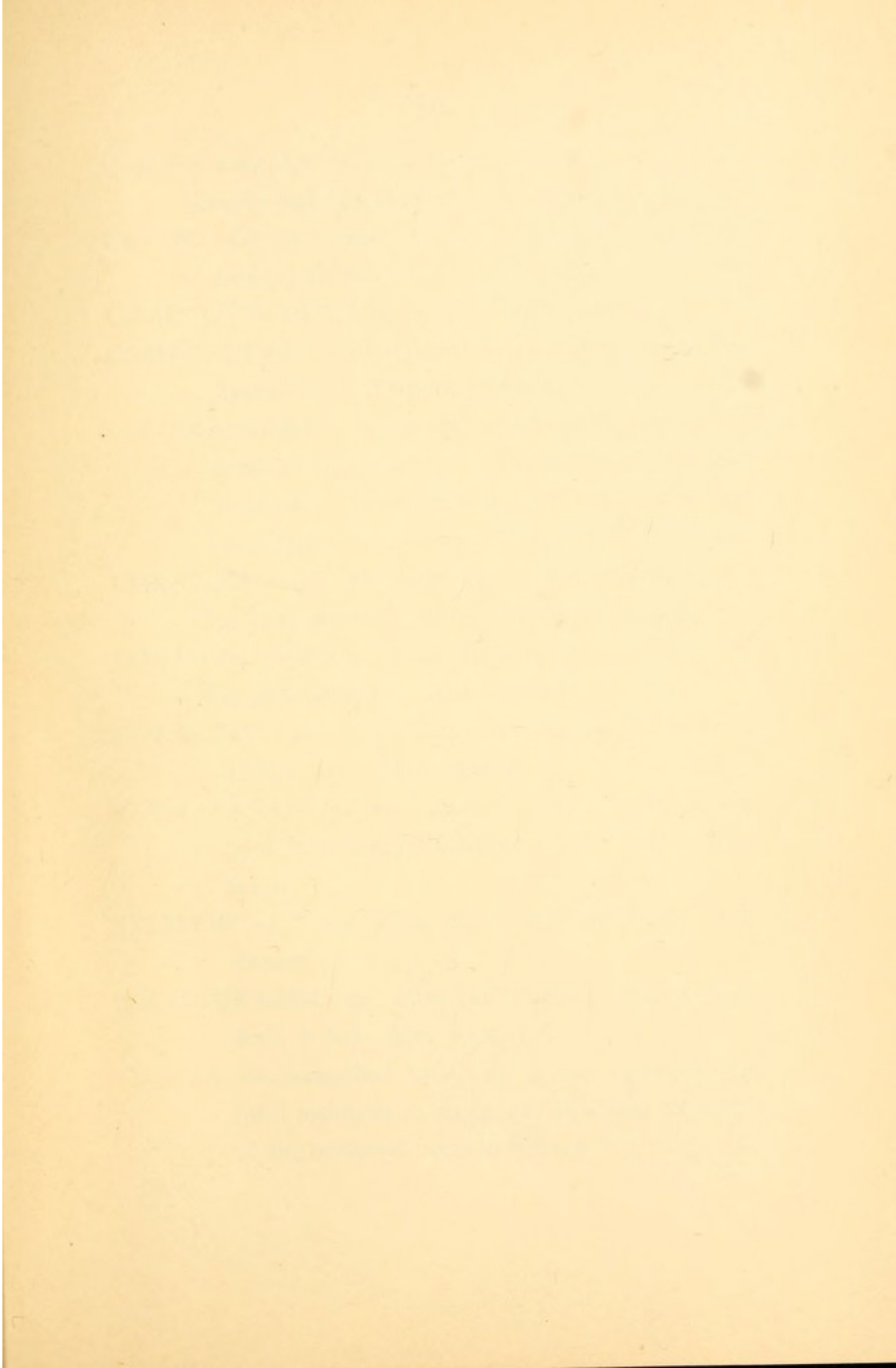
ARTHRITIS.—(< Gr. *arthron*, joint, *itis*, affection.) Inflammation of a joint, which may include any or all of the structures composing the articulation.

ARTHROPATHY, SPINAL.—(< Gr. *arthron*, joint, + *pathos*, affection.) Charcot's disease.

BRISEMENT FORCÉ.—(< Fr. forcible breaking.) Forcible breaking up of adhesion in a joint.

CALCANEUS.—(< Gr. *calx*, heel.)

Variety of talipes in which dorsum of foot is drawn upward by contraction in direction of shin, the heel alone touching the ground in walking.







CARIES SICCA.—(< Lat. *caries*, necrosis ; *sicca*, dry.)

Carious arthritis without suppuration.

CAVUS.—(< Lat. *cavus*, hollow.) Hollow, *e. g.* : *pes cavus*, hollow foot.

CHARCOT'S DISEASE.—Spinal arthropathy..

CONTRACTION.—Functional shortening of muscles or ligaments; a temporary condition.

CONTRACTURE.—Structural shortening of muscles, tendons or ligaments. Depends upon organic changes in these parts and is progressive and permanent.

COXALGIA.—(< Lat. *coxa*, hip, + Gr., *algos*, pain.)

Hip joint disease ; literally, pain in the hip.

COXAGRA.—(< Lat. *coxa*, hip, + *agra*, seizure.)

Hip joint disease. Also sciatica.

COXARTHROSIS.—(< Lat. *coxa*, hip, + Gr. *arthron*, joint.) Hip joint disease.

COXA VARA.—(< Lat. *coxa*, *æ*, hip ; *varus*, *a*, *um*, bent, crooked.) Bending of the neck of the femur.

COXITIS.—(< Lat. *coxa*, hip, + *itis*, affection.) Hip disease.

CRANIOTABES.—(< Late Lat. *cranium*, < Gr. *kranion*, skull + Lat. *tabes*, wasting.)

A circumscribed softening of the bones of the skull resulting in patches of thinness, especially of the occipital bone in rickets.

**DEFORMITY.**—(< Lat *de*, out of, + *forma*, shape.)

A deformed or misshapen condition; an unnatural growth or a distorted or misshapen part or member.

**DISTORTION.**—(< Lat. *distortio*, from *distortus*, past participle of *distorqueo* < *dis*, apart, + *torqueo*, twist.) An unnatural curvature of a bone or obliquity of a member.

**EQUINO-VARUS.**—(< Lat. *equus*, horse, + *varus*, bent.) Variety of talipes in which equinus and varus co-exist. Similarly, *equino-valgus*.

**EQUINUS.**—(< Lat. *equus*, horse, + *inus*, resembling, or relating to.)

Club-foot (talipes) characterized by a depression of the front part of the foot and elevation of the heel. Compared to the foot of a horse.

**EPIPHYSIS.**—(< Gr. *epi*, upon, + *phuo*, grow.)

Portion of bone separated from the body of the bone by a cartilage which becomes bone by age.

**ERASION.**—(< Lat. *e*, out, + *rado*, scrape.)

The act of scraping; opening and scraping out the morbid contents of a joint. Arthrectomy.

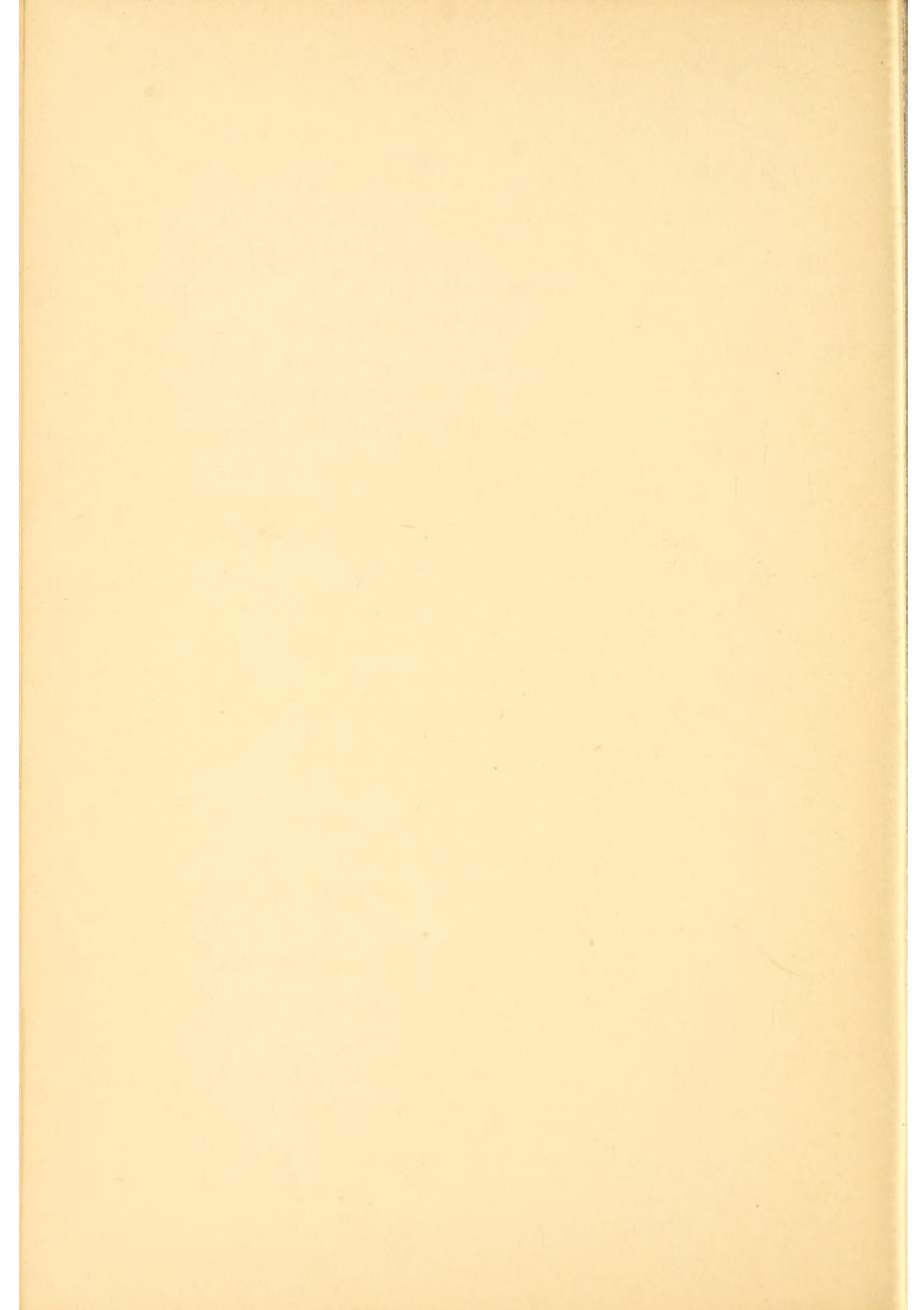
**EROSION.**—< Lat. *e*, out. away, + *rodo*, to eat, corrode.)

Action of a corrosive substance or pathologic process upon tissues producing their gradual destruction.









EXCISION.—(< Lat. *ex*, out, + *caedo*, to cut.)

Operation of removing the extremities of bones composing a joint; the removal of any part with cutting instruments.

FRIEDREICH'S DISEASE.—Hereditary ataxia.

GENU RECURVATUM.—(< Lat. *genu*, knee; *recurvatum*, < *re*, back, + *curvatum*, curved.)

Curving backward of knee joint from muscular paralysis and weakness of ligaments.

GENU VALGUM.—(< Lat. *genu*, knee; *valgus*, *a*, *um*, bent.) Knock-knee, the legs being bent outward from the knee.

GENU VARUM.—(< Lat. *genu*, knee; *varus*, *a*, *um*, bent or curved.) Bow-legs; bandy-legs. The opposite of genu valgum.

GENUCLAST.—(< Lat. *genu*, knee, + Gr. *klao*, break.)

Apparatus for forcible breaking up of the adhesions or ankylosis at the knee.

HALLUX VALGUS.—(< Gr. *hallux*, great toe < *hal-lomai*, to leap; Lat. *valgus*, bent.)

Distortion or dislocation of great toe outward.

HALLUX VARUS.—(< Gr. *hallux*, great toe; Lat. *varus*, bent.) Dislocation of great toe inward.

HEMIPLEGIA.—(< Gr. *hemi*, half, + *plege*, stroke.)

Paralysis of motion on one side of the body.



**HYDRARTHROSIS.**—(< Gr. *hydor*, water, + *arthron*, joint, + *osis*, affection.) White swelling. Tuberculous arthritis.

**HYDROPS.**—(< Gr. *hydrops*, dropsy.)

Hydrops tuberculosus. Variety of tuberculous affection of a joint which is accompanied by profuse amount of intra-articular effusion.

**KYPHOSIS.**—(< Gr. *kyphosis*, < *kypto*, bend.)

Curvature of the spine, causing convexity or angularity of the back. Posterior curvature.

**LAMINECTOMY.**—(< Lat. *lamina*, plate, + Gr. *ectome*, excision.) Excision of laminae of a vertebra.

**LORDOSIS.**—(< Gr. *lordosis*, < *lordos*, bent back.)

Curvature of the spine with the convexity forward.

**METATARSALGIA.**— (< Gr. *metatarsus*, + *algos*, pain.) Pain in the metatarsus. Morton's Neuralgia.

**MORBUS COXÆ.**—(< Lat. *morbus*, disease; *coxa*, æ hip.) Hip disease.

**MORTON'S DISEASE.**—Metatarsalgia.

**NEUROMIMESIS.**—(< Gr. *neuron*, nerve, + *mimesis*, imitation, < *mimeomai*, imitate. Hysterical joint.

**ORTHOPÆDIC.**—(< Gr. *orthos*, straight, + *pais*, (*paid*) child.) The correcting and preventing of deformities in any part of the body, especially in the case of infants. Strictly speaking, includes plastic surgery.





OSTEITIS.—(< Gr. *osteon*, bone, + *itis*, affection.)

Inflammation of bone.

OSTEOCLASIS.—(< Gr. *osteon*, bone, + *clasis*, fracture, < *klao*, to break.) Fracture of bone for the purpose of correcting deformity.

OSTEOMALACIA.—(< Gr. *osteon*, bone, + *malakia*, softening, softness.) The softening of bones due to deficiency of earthy matter. Mollites ossium.

OSTEOTOMY.—(< Gr. *osteon*, bone, + *tome*, incision.)

Section of bone for correcting deformity.

PARAPLEGIA.—(< Gr. *para*, through, + *plege*, stroke, < *plesso*, strike.) Paralysis affecting entire body below a certain horizontal line.

PERIARTHRITIS.—(< Gr. *peri*, around, + *arthron*, joint, + *itis*, affection.) Inflammation of tissues surrounding a joint.

PES.—(< Lat. *pes*, the foot; genitive *pedis*.)

The foot, *e. g.*, *pes cavus*, *pes planus*.

PLANUS.—(< Lat. *planus*, *i.* flat.) Flat.

POTT'S DISEASE.—Caries of the spine. Tuberculosis of the bodies of the vertebræ.

RACHITIS.—(< Gr. *rachis*, spine, + *itis*, affection.)

Rickets. Also written Rhachitis.

RESECTION.—(< Lat. *resectio*, < *re*, again, + *seco*, to cut.) The operation of cutting out a portion of a bone or nerve.

SPONDYLITIS.—( < Gr. *spondylus*, a vertebra, + *itis*, affection.) Inflammation of the vertebræ.  
Pott's disease.

SPONDYLOLISTHESIS, OR SPONDYLISTHESIS.—  
( < Gr. *spondylus*, a vertebra, + *olisthesis*, slipping or sliding.) Dislocation of the vertebræ, as of the last lumbar vertebra forward on the sacrum, thus producing pelvic contraction.

SUBLUXATION.—( < Lat. *sub*, under, less than, + *luxo*, to dislocate.) Imperfect luxation of a bone; sprain.

SYNOVITIS.—( < Gr. *syn*, with, + Lat. *ovum*, an egg.) Inflammation of the membrane lining a joint. (Synovial fluid resembling egg albumen.)

TALIPES.—( < Lat. *talus*, ankle, + *pes*, foot.) Club-foot. In combination with *varus*, *valgus*, *equinus* and *calcaneus*, which see.

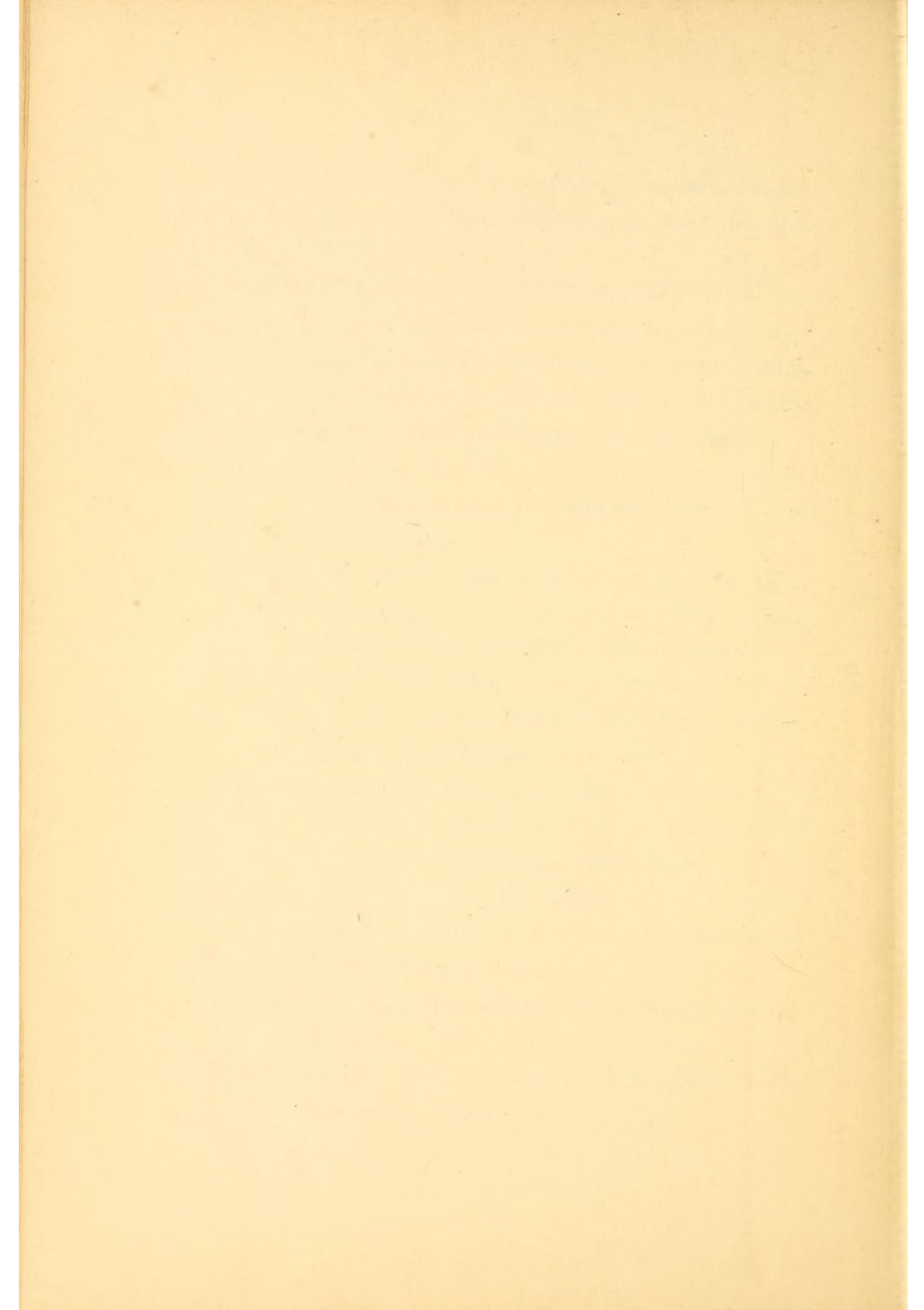
TALIPES VALGUS.—( < Lat. *talipes*, club-foot; *valgus*, bent.) Variety of club-foot characterized by outward displacement of the foot.

TALIPES VARUS.—( < Lat. *talipes*, club-foot; *varus*, bent.) Variety of club-foot characterized by bending inward of the foot.

TALUS.—( < Lat. *talus*, ankle.) Astragalus, malleolus, ankle.

TORTICOLLIS.—( < Lat. *torqueo*, *tortum*, twist, + *collum*, neck.) Wry neck.





TUMOR ALBUS.—(< Lat. *tumor*, swelling ; *albus*, *a*,  
*um*, white.) White swelling.

VALGUS.—(< Lat. *valgus*, bent, curved.)

Applied to extremities when distorted ; outward  
in talipes valgus and hallux valgus, inward in  
knock-knee (*genu valgum*).

VARUS.—(< Lat. *varus*, bent, curved.)

Applied to extremities when distorted ; inward in  
*coxa vara*, hallux varus and talipes varus, out-  
ward in bow-legs (*genu varum*).

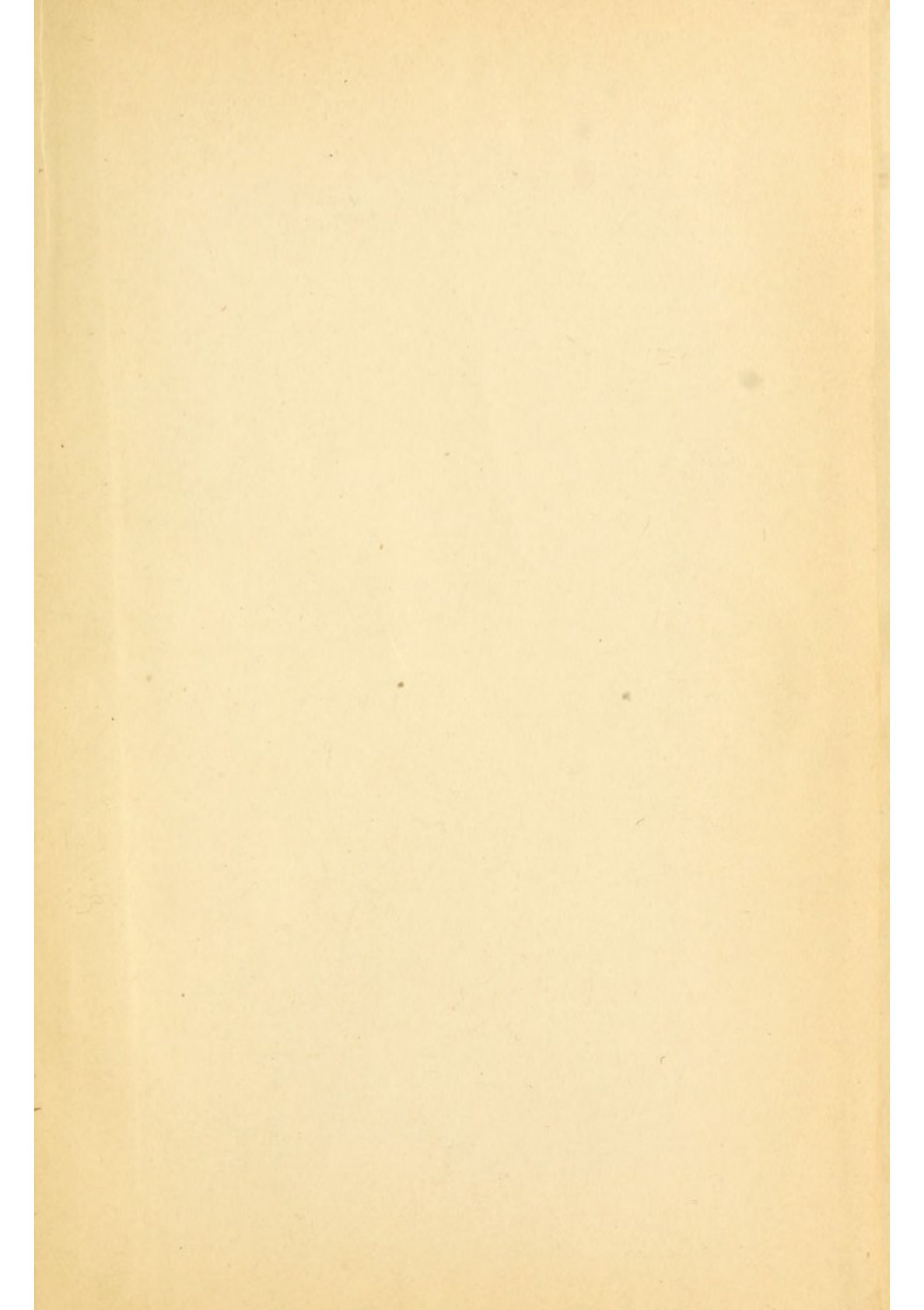
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