

JACOBI (A.)

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Clinical Professor of Pediatrics in the Medical Depart-  
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A discussion at the meeting of the American  
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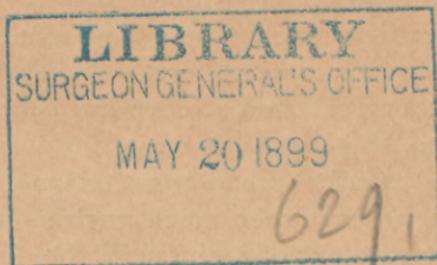
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## RACHITIC DEFORMITIES.\*

### ETIOLOGY, CLINICAL HISTORY AND LESIONS.

BY A. JACOBI, M.D.,

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New York.

I rise with much diffidence, for I am to discuss a subject with which you are familiarized from day to day. You see these rachitic deformities so frequently that I am afraid I shall repeat, from my point of view, things which are to you matters of daily observation and experience.

Our subject is the etiology and the lesions of rachitic deformities. By way of introduction, I would say that rachitic deformities are something new in our country. You have seen so many of them that undoubtedly the younger men here do not remember the time when there were no rachitic deformities in this country. Thirty years ago there was no rachitis, except very rarely a stray case. At that time, when I spoke of rachitis and endeavored to demonstrate a case in my clinic, I had to hunt considerably for material to illustrate this condition. When, twenty-two years ago, I wrote a paper on the first cases of cranio-tabes I had seen in New York, it was, with the exception of one by Parry, of Philadelphia, the first paper on this subject ever written in our country. The subject

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\* (A discussion at the meeting of the American Orthopedic Association, at Washington, D.C., May 30, 1894.—Stenographic Report.)

of rachitis, therefore, is a comparatively novel one. Since that time, immigration has been going on, and the poverty-stricken people from the slums of Europe have been accumulating here. As with the greater facilities for transportation science has been equalized all over the globe, so poverty, bad air, and want of every description have equally spread constitutional diseases here. Since then we have seen much rachitis here. Thus, it is that the treatment of rachitis in the future, although it will always remain medical, will also be a social question.

The principal causes of rachitic deformity are numerous—the rapid growth, the thick epiphyses, the soft diaphyses, the condition of the ossification cartilage, the traction of the muscles, the debility of the muscles, and the pressure of the atmosphere. The locality where the deformities are found depends largely upon the intensity of growth. Growth is most intense in the young child—(1) in the cranium ; (2) in the chest ; and lastly only in the extremities. I recapitulate only what you all know when I speak of the rachitic head, with the thin skin, the dilated veins, and the open sutures and fontanelles for two, three, four, or even nine years, as I have seen it. The edges of the sutures are irregular. Such a head is usually large—actually larger than the normal head—relatively it is very much larger when compared with the frequently small body. It is so large that it resembles sometimes the hydrocephalic head. Indeed some of these heads are to a certain degree hydrocephalic ; some are entirely so. Most of them are brachy-cephalic, quadrangular, with depression on top. In a peculiar class of cases, first studied by Virchow, that of the cretins and semi-cretins, rachitis is combined with a premature ossification of the occipito-sphenoidal synchondrosis. In this condition the base of the skull is shortened. At the same time there is a deep grooving of the root of the nose, the eyes are widely separated from each other, there is shortening of the vomer, and the flat palate so characteristic of cretinoid conditions. Not infrequently the occiput is slightly flattened, and the oblique diameters are sometimes not

equal, so that one side may appear to be entirely flattened. This is particularly the case when we deal with rickety softening of the cranial bones—*cranio-tabes*. In such cases, there is much perspiration, with loss of hair on the occiput; the veins are more dilated, the skin thinner and paler than in the average head. In these cases of *cranio-tabes* one side may be flattened and the other side bulging. The head may even appear to be triangular. Where one side bulges out, and one side is flattened from pressure, the forehead is very prominent, sometimes even from three to five times its normal thickness, because of an immense amount of new periosteal soft growth between the periosteum and the bones, which produces a marked deformity of the forehead. This is not always a temporary affair. It is true that *cranio-tabes* may leave no trace if it gets well sufficiently soon, but when there is much deposit under the periosteum, it will sometimes remain. When calcification takes place very suddenly, then the thickening of the bone will remain unabsorbed for life. As a rule, however, most of such thickenings are absorbed.

The condition of the teeth is certainly one which should be considered in connection with rachitic deformity. The teeth appear late or irregularly; when early, the intervals between the first crop and the second, or between the second and the third are very long—sometimes six, eight, or ten months. The teeth are frequently discolored, and they decay very easily. Sometimes, however, we find in the second crop that the teeth are very hard and very yellow. Not infrequently we see "*Hutchinson teeth*" in rachitic children. This is one of the reasons why Parrot got the idea of explaining every case of rachitis as the result of syphilis. The lower jaws are short, narrow and very low, the angles very sharp and prominent. The alveolar processes turn inward. Thus, the teeth of the upper jaw do not cover those of the lower jaw. The chin in some cases is very low. From the foregoing remarks it will be seen that well-marked rachitic heads present a very peculiar appearance.

The trunk in rachitic persons is very short. The clavicle shows much periosteal thickening ; it is very frequently bent forward by the pulling of the muscles, and there is not infrequently an infraction between the middle and anterior thirds.

The chest is the seat of a great deal of deformity. It is frequently triangular, sometimes quadrangular ; the dorsum is flat and the scapula clings to the body. The ribs being soft, form a groove in which the arms are frequently buried. There is a predominance anteriorly. On account of the atmospheric pressure laterally above the diaphragm, there is a horizontal groove, called "Harrison's groove." As there is compression above the diaphragm the lower ribs stand outward. As the chest is compressed laterally the sternum is made to protrude, particularly about the third and fourth ribs, and the antero-posterior diameter is lengthened. The ribs are prominent at the ossification point. On the cartilages there are frequently nodulations ; a complete rosary may be developed quite early. I have seen it at the age of two months, and a case has been published in which there was a complete rosary in a baby of only three weeks. In these extreme cases, the sternum is flat, and the manubrium stands out ; frequently it is pressed down above so as to stand out at an angle at its lower end ; the lower end of the sternum may be retracted while the ensiform process protrudes.

Kyphosis is very frequently seen in these cases. It is often but an exaggeration of the normal curvature. Scoliosis has mostly its convexity to the right with compensation above and below. The spinous processes are very frequently directed to the concavity. The intercostal spaces are very narrow on the left side, because there is less curvature of the ribs, and the ribs are bent out.

In the grown up woman the antero-posterior diameter of the pelvis is shortened. This is not seen to the same extent in the babe. In the normal baby the pelvis is small and the sacrum very steep, not concave as in the adult. Therefore, when compression has taken place because of softening, it is still smaller so that often it is quite diffi-

cult to examine the pelvis satisfactorily; the sacrum may be so changed as to give rise to a convexity inward and contraction of the two sides. This narrowing may be due to the mere fact that the softened bones are compressed on the pillow, or by the arms of the nurse, a pressure which is slight, it is true, but quite sufficient. In very mild cases the symphysis is changed but little. In a number of instances, however, it will be found to be bent forward, and thus in very early rachitis, the rachitic pelvis is very similar to the pelvis deformed by osteomalacia. This is contrary to the usual description in the books on obstetrics.

The extremities suffer in different ways, in all their parts—the epiphyses and diaphyses, the periosteum, and the epiphyseal cartilages. The epiphysis is frequently thick and painful, particularly on the forearm and tibia. A number of cases of so-called “growing pains” are simply instances of rachitic epiphysitis. Sometimes the thickening is very considerable; in most cases it is uniform, but in some, it is more developed laterally. This is particularly the case on the upper part of the thigh. The diaphysis is usually bent. Semi-fractures take place in the arm, clavicle and legs from a very trifling application of force. The periosteum, however, being soft, always acts as a shield to the inflamed bone when exposed to the danger of fracturing. In all those cases in which there is much curvature, particularly in the lower extremity, the concavity is inward, and on the forearm and thighs it is very often anteriorly. The difference in the direction of the curvatures depend on the influence of the muscular traction, or of the weight of the body. In the very young the concavity of the lower extremity is inward because of the effect of the flexor muscles. When the bones become or remain soft in those who attempt to walk, the weight of the body results in outward curvatures, and lesions of many kinds.

The ligaments are very flabby, and give rise to flat-foot in children that stand up and attempt walking. The periosteum suffers a great deal, and in different ways. It is

softened and exhibits a thick layer of rachitic deposit. Calcification occurs in time, and then the diaphysis will be much thicker and harder than in normal conditions. The bones of rachitic patients, when recovered, are solid and able to stand a great deal of hardship in later life.

In the rachitic periosteum there may be hæmorrhages. Not infrequently in bad cases of rachitis, and in those cases which in the course of general illnutrition develop purpura, there are hæmorrhages under the periosteum in the lower and upper extremities. Many such cases of decided rachitis, and those which exhibit similar hæmorrhages without being marked by rachitis, have been thrown together under the heading of, in this country, "scurvy," and abroad, "acute rickets." In all of these cases, the children are ill-fed; there is a great deal of pain in the lower extremities and feet, sometimes with, and sometimes without periostitis. The hæmorrhages will heal and leave a thickening in part of the cases. Hæmorrhage of gums is not a requisite for the diagnosis; it may be absent in those who have no teeth, or who have; and present even where there are no teeth.

Finally, deformities consisting of shortening of the whole limb are due to the early calcification of the epiphyseal cartilages. It is on this physiological function that the length of the diaphysis depends. When calcification is complete, the growth of the bone, and that of the limb ceases.

I wish to remind you that rachitis is a general constitutional disease. In it we have to deal not only with the general system, particularly with another part of the locomotor system—the muscles. The muscles suffer just as well as the bones in rachitis, and give rise to certain deformities. Both voluntary and involuntary muscles are affected. What has been called rachitic pseudo-paralysis, is not paralysis, it is simply a weakness of the muscles and nothing else. We should have been spared this new term. The muscles are simply poorly developed, and in consequence they are easily fatigued. The involuntary muscles suffer in the same way.

While the muscular tissue is poorly developed fat is liable to be ample. Rachitic children, unless emaciated by pulmonary or intestinal diseases, are apt to be heavy and rotund, and their weight and appearance are often mistaken for healthy development. But they are flabby, anæmic, and not capable of resisting attacks of ordinary diseases like well children. They prove, moreover, that weight alone is not the measure for healthy and steady evolution.

The muscles in such subjects are flabby, and consequently the stomach is apt to be dilated, and the muscular layers of the intestine are apt to yield, thus giving rise to large, flabby abdomens filled with gas, on the surface of which are dilated veins.

The expansion of the intestines, owing to the weakness of the muscles, gives rise to constipation. This constipation is characteristic. Rachitic children become constipated very early. It is sometimes the first symptom of rachitis, and shows that the muscles participate in the process at a very early stage. It may begin at the second or third month of life in a child presenting evidences of fairly good nutrition ; and it at once leads us to suspect rachitis. Some deformity of the abdomen may be due to the spleen, liver and kidneys. In consequence of "Harrison's groove" the liver and spleen are not infrequently displaced, and these organs for the same reason may appear larger than they really are. The kidneys may be found floating. Most of the cases of floating kidney occurring in children that I met with were in rachitic children, showing Harrison's groove well developed. But there are cases in which the spleen and liver are actually enlarged, from slow congestion and interstitial hyperplasia. They cause the same deformity that is occasionally seen in syphilitic subjects. This is another reason why Parrot came to the conclusion that every case of rachitis must be syphilitic.





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