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SOME OBSERVATIONS

ON

BOW-LEG AND IN-KNEE

WITH ESPECIAL REFERENCE TO THE QUESTION OF OUTGROWTH OF THESE DEFORMITIES

BY

ROYAL WHITMAN, M.D.

ORTHOPEDIC SURGEON TO THE BOSTON DISPENSARY

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A LARGE proportion of the cases seen at an orthopedic clinic are deformities of the lower extremity (bow-legs and in-knees). Any radical treatment in such cases is especially difficult, because of the firmly held belief among parents that these deformities are outgrown, and even the application of apparatus is objected to or delayed until such treatment is ineffectual. Family physicians usually advise delay, and that authorities differ may be seen by the following brief extracts from three of the many writers on this subject :

"When rachitis has disappeared such amount of curvature may remain as to require treatment. In the great majority of cases this is unnecessary, since, as has already been stated, the curvatures spontaneously disappear with the growth of the skeleton. Only in the leg, curvatures sometimes remain so that the foot is distorted and only

the inner or outer border can be placed on the floor. If this remain for years at the same point an attempt may be made to straighten it." [1]

"The curvatures of rachitis often become less marked during growth, but many of them are so severe that they remain for life. These might have been benefited by timely interference." [2]

"Most of our best surgeons are of the opinion that the so-called *vis medicatrix naturæ* is sufficient to correct the deformed leg if sufficient time be allowed for it to regain the necessary strength, hardness, and ability to bear the weight placed upon it. This is a most dangerous error. No time, no natural process, is sufficient to bring a bent bone which, by a diminished quantity of lime-salts, has once lost its original elasticity back to its normal position." [3]

It is evident that the only way this question of outgrowth could be conclusively settled would be by a series of observations on children suffering from these deformities, extending over the entire period of growth. Such observations have never, to my knowledge, been made, and how the authorities who believe in such outgrowth arrive at their conclusions is not stated. Meanwhile, is one justified in allowing the comparatively short time, during which these bent bones can be easily replaced, to go by? I think not, as I shall endeavor to show.

In considering this subject, as to the advisability of treatment, I concluded to make some observations on the prevalence of bow-leg and in-knee among adults, thinking that by comparing such results with the supposed prevalence of such deformities in children, some general conclusions might be arrived at. Aggregations of adults on whom observations might be made, being presumably of a better or worse grade, it was finally de-

[1] Billroth: Surg. Path. Tenth edition.
[2] O. Lannelongue: Nouv. Dict. de Méd. et de Chir., art. Rachitisme.
[3] John Bishop, F.R.S., etc.: Unters. üb. d. Wesen u. d. Behandlung d. Deformitäten d. Menschl. Körpers.

cided that the opportunity which presented itself in the streets of Boston would be most satisfactory. This, of course, limited me to adult males, but as the deformities under consideration were more of cosmetic than of medical importance, this did not seem an objection.

These results are as follows:

Number of observations.	Number of adults observed.	Bow-legs.	In-knee.
1	25	6	2
2	25	4	1
3	30	6	1
4	13	1	2
5	65	9	2
6	27	5	..
7	37	9	..
8	23	5	..
9	27	6	..
10	68	12	2
11	34	6	..
12	52	8	2
13	21	3	1
14	28	6	..
15	20	4	..
16	51	8	..
17	58	13	1
18	24	3	1
19	14	4	.
20	92	19	2
21	60	9	1
22	57	11	..
23	92	13	2
24	57	20	1
25	94	18	.
26	78	21	..
27	48	8	1
28	45	8	2
29	150	30	1
30	70	17	..
31	65	11	1
32	143	28	2
33	87	25	1
34	136	21	2
35	47	16	..
36	37	7	1
Totals	2,000	400	32

Thus, according to these observations, the legs of one adult male in five, or twenty per cent., are curved to a greater or less degree, while only one in sixty-two, or .016 per cent., are affected with in-knee.

As to the relative frequency of these deformities in children, no very satisfactory statistics can be obtained. Most observations have been on the prevalence of rachitis, without regard to deformities, among children presented at hospitals for various diseases or injuries.

McNamara states it to be as high as thirty per cent. at hospitals, and believes it to be as frequent among children of the better classes, induced by the cold, damp climate of England.

Parry found twenty-eight per cent. of children at Philadelphia hospitals affected with rachitis.

Gee, thirty per cent. at London hospitals.

Ritter von Rittershain, thirty-one at the Prague Poliklinick.

Smith, among the children at the various institutions in New York over which he had supervision, found less than ten per cent. affected by rachitis.

I have no data from which to estimate the prevalence of rachitis and its resulting deformities in children, other than by general observation of children in the poorer quarters of the city and at the primary schools, but I am convinced that the proportion of these deformities among children will not exceed, even if it equals, it in adults.

It seems reasonable to suppose that in certain cases bow-leg may be an inherited peculiarity, and not the result of disease. Again, a certain proportion of these deformities are developed during adolescence, as shown by the well-known prevalence of in-knee among the bakers of Vienna, induced by the peculiar strain to which their knees are subjected, and very probably bow-legs may also result from certain laborious occupations.

In considering this question of outgrowth of rachitic deformities, it must be remembered that the upper and lower extremities stand in completely different relations. In the

arms, their weight alone tends to rectify it, and the strains to which they are subjected also tend in the same direction, but the legs, already weakened by disease, have a constantly increasing weight to bear. It is very possible that the bones may so gain in strength that the deformity may not increase, and as the leg grows longer it becomes less marked. Still it must be remembered that the majority of children one is called upon to treat for such deformities are already from thirty to thirty-six inches in height, and that the curve in a well-marked case of bow-leg, even if lessened one-half, would still remain in the adult a noticeable deformity.

Thus, taking into consideration all possibilities and probabilities, the following will, I think, be considered fair propositions:

1. A bow-legged boy is more likely to become a bow-legged man than a boy with straight legs.

2. If such a proportion of bow-legs exists among adults as would appear by these observations, it would seem more reasonable to treat such cases in children, rather than to trust to nature for their rectification.

3. If these deformities are to be treated, the sooner treatment is applied the better.

At an orthopedic clinic children are rarely seen during the acute stage of rachitis. In my experience, those applying may be divided into three classes—

First, those who have evidently suffered from a severe form of the diseases, with various irregular curvatures of the bones, which are thickened and deformed, usually with marked inequality, between the upper and lower extremities, stunting of the growth, etc.

Second, children with no well-defined history of rachitis, tardy in development, showing slight general enlargement of the epiphyses, with curvatures principally in the lower extremities.

Third, large, active children with curvatures of the lower leg, with no history of rachitis, and, in many cases, no signs of the disease excepting the deformity.

The proportion of cases in these two latter classes is much greater than in the former, from which I infer that the children of Boston are subject to a milder form of the disease than often occurs elsewhere. The worst cases that I have seen have been among Italian and colored children, especially the latter. I have also noticed a greater proportion of deformities of the leg among adult negroes, though my observations have been too limited to be of any particular value.

In-knee, a much less frequent deformity, I have only considered incidentally. Why rachitis should in one child cause bow-legs and in another in-knee has never been satisfactorily explained. Possibly, in some cases, a weak child in attempting to stand aids itself by pressing the knees together, the feet being widely separated for a larger base of support. This position, combined with lax internal lateral ligaments, with possibly an exaggerated outward bending of the femur, might induce this deformity. It is a much more serious deformity than bow-leg, as interfering more with locomotion, and as tending to produce laxity of the ligaments at the ankle, with flat-foot, a condition often accompanied by more or less pain.

As to treatment, of course the general condition is of the first importance, but, as has already been stated, these cases are rarely seen until they have nearly or quite recovered from the original disease.

If a patient is seen early enough mild forms of the deformity may be remedied by massage with daily bending of the bones, with possibly the application of splints at night, the child being restrained as much as possible from walking. In more advanced cases suitable apparatus may be applied. In moderately stiff bones I prefer the gradual forcible reposition under ether, with retention by plaster bandages. Often the bones crack during the operation, green-stick fractures being apparently produced. Apparatus, which may be applied at the end of a few weeks, is then simply retentive.

In stiff bones, where the external or anterior curves are low down, apparatus is in most cases useless, and osteoclasis or osteotomy should be performed, osteoclasis being safer when children are to be treated at their homes. In-knee can usually be remedied by apparatus; in more severe cases, where it is not considered advisable to perform osteotomy, the epiphyses of the femur may be partially separated and plaster bandages applied, to be replaced by suitable braces at the end of a few weeks.