FROM THE ORTHOPAEDIC CLINIC OF LUND, SWEDEN
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EARLY COXA PLANA

Age Studies.

BY

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In the literature it is generally asserted that aseptic bone necrosis is bound to definite age and growth periods varying according to the localization of the disease. Aseptic bone necrosis is one of those diseases occurring mainly in the growing skeleton. This applies no less to coxa plana, whose onset is generally presumed to be restricted within narrow age limits. Nearly everywhere do we read that this disease is peculiar to kindergarten and early school age. Some authors such as *Mathieu* and *Ombredanne, Köhler, Mac Murray* and *Mercer* contend that 5-6 years is the common age for the appearance of symptoms, whilst *Severin* believes it to be 4-7 years, *Sjövall* roughly between 5-10 years, and *Schinz,* 5-12 years. On the other hand *Gill* is of the opinion that coxa plana may occur at any age between 3 and 11 years, and *Jackson-Burrows* maintains that the upper age limit is 18 years.

The cited age limits must, however, be considered in the light of the fact that they refer to the patient's age at the time of the first medical or X-ray examination, which is obviously not coincident with the age of the patient at the commencement of the pathological process. On the contrary, the frequently insidious onset of coxa plana and often prolonged latency before the occurrence of any substantial discomfort usually involve a more or less considerable difference between these two ages. The recognition of the *order of magnitude* of this difference may

be of certain interest. Another question arising in this conjunction is whether the healing prospects are more favourable and the healing process more rapid in younger infants with their well-known regenerative capacity. The purpose of the present study is to endeavour to find an answer to these two questions.

The difference between the age curves can certainly not be evaluated on the basis of the anamnestic reports of subjective trouble as given by these young patients, or of the observations made by the parents concerning the child's attitude etc., because of the very relative exactitude of such data. On the other hand, the radiographic picture ought to provide a more valuable key for the estimation of the age of the illness and offer certain possibilities of antedating the actual commencement of the disease.

Even though the nature and the real cause of the changes characteristics of coxa plans are still obscure, the X-ray picture and the radiographic development of the disease are well known. *Waldenström* has shown that the earliest radiographic changes consist of a slight flattening of the antero-superior contour of the caput epiphysis and a slight increase in the distance between the latter and the bottom of the acetabulum. According to *Brailsford* and *Gill,* a simultaneous occurrence of a slight metaphyseal decalcification often limited to an essentially coniform islet, the base of which lies in apposition to the epiphyseal line is also observable. *Brailsford* considered the duration of the pathological process prior to this radiographically visualizable status to be 2-3 months. The radiograph gradually reveals increased density of the caput epiphysis, subchondral rarefactions, fragmentation of the epiphysis, and a broadening of the neck of the femur. *Brailsford* estimates the age of the lesions in these cases to be 3-18 months. Repair processes then begin to dominate the picture in which a resorption of the densified areas is indicative of a commencement of the healing stage. The last mentioned author evaluates the age of these cases to be 1½-4 years. In his opinion the bone is not definitively re-consolidated until after the elapse of 4 years. All of the above values are to be considered as minimums, and it is possible that the changes observed are

representative of longer periods than those presumed by *Brailsford*. These figures seem however to coincide well with those experiences the present writer made in an earlier study of lunatomalacia, whereby it should be observed that no attempt is made at drawing any comparisons or parallels in any other respect between these two diseases. The writer found that sclerosis of the lunate was discernible in the X-ray picture on an average three months subsequent to the occurrence of the primary fracture, and that fragmentation was observable after the elapse of approximately nine months.

These intervals seem to be verified also[1] by the results of an investigation made by the author of epiphyseitis in association with congenital hip dislocation. Also in these cases does it seem to be a question of aseptic bone necrosis due to impaired or totally obstructed blood supply to the epiphysis of the head of the femur caused by the reposition trauma (*Meyer*). One advantage of these cases of epiphyseitis is that the commencement of the pathologic process, the reposition, can be definitely dated. The dates available in cases of epiphyseitis are therefore more reliable. In 22 cases of epiphyseitis it was observed that the initial radiographic signs of the disease consisting of a densification of the core of the epiphysis as well as contour and structural changes were visualizable as a rule 3.7 $\pm$ 0.3 months after the reposition trauma. The shortest interval that could be registered between the reposition trauma and the appearance of radiographic changes was 2 months, the longest being 7 months. It is, however, probable that these changes had been visualizable already earlier in at least some of those cases in which the interval between reposition and radiographic examination was unusually long and the changes revealed in the X-ray picture already advanced when first observed. Epiphyseitis will be reverted to in another connection later on in this paper.

The author perused the coxa plana material available at the Orthopaedic Clinic of Lund, and the "Vanföreanstalten" at

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[1] I beg to express my gratitude to Dr. *Kurt Stenport* for permitting me to inspect the material at Hälsingborg's "Vanföreanstalt".

Hälsingborg. All those cases that were healed already on first radiographic examination were excluded, only florid cases being taken into account. Besides this, a number of cases in which for some reason or other only *one* X-ray examination had been made and in which the diagnosis was uncertain, were also disregarded. The evaluation of the X-ray pictures and the antedating of the commencement of the disease was carried out on the following lines: Cases with early changes including more or less pronounced sclerosis of the caput epiphysis were considered to be at least three months old. If conspicuous fragmentation was manifestable, its duration was believed to be 9 months, and if the healing process had begun already on first examination, it was considered that the pathological process had existed at least 18 months prior to examination. A more accurate evaluation of the ages of the disease was deemed impossible.

It was divulged that the average age of the patients of this material consisting of 103 hip joints was on first medical examination 7.7 years $\pm$ 2.9 months. The dispersion is large, $\pm$ 29.9, and the highest registered age for florid coxa plana was $13^{1}/_{12}$ years, the lowest being $2^{5}/_{12}$ years. The age curve of the first medical examination exhibits a steep crescendo from 3 yrs. to 6-7 yrs., after which the curve pursues a relatively level course finally to drop abruptly from 9 to 13 yrs. This clearly evidences that coxa plana is not confined to a very narrow age range but may occur within rather wide age limits. The truth of this fact will be more apparent if the actual commencement of the pathological process is evaluated in the above mentioned manner and not the date of the first medical examination considered as the onset day of the disease. The lowest estimated age is then $2^{2}/_{12}$ years, whilst the highest in this material is unchanged, it still being $13^{1}/_{12}$ years (a bilateral case in which coxa plana developed in the hip joint which was clinically and radiographically sound at the beginning of observation).

The average age is about one year lower, namely 6.6 years $\pm$ 2.8 months. The dispersion is $\pm$ 28.2. The top of the curve is sharper and more marked than that of the age curve pertinent to first medical examination. This might possibly indicate that

also factors other than clinical trouble might play a part in prompting the patient to seek medical aid, e.g. on advice of the school teacher. It is also evident that the majority of cases of coxa plana consist of rather relatively advanced cases and as the deformation of the caput is therefore often pronounced already at the beginning of the treatment the prospects of successful treatment ought to be viewed with scepticism.

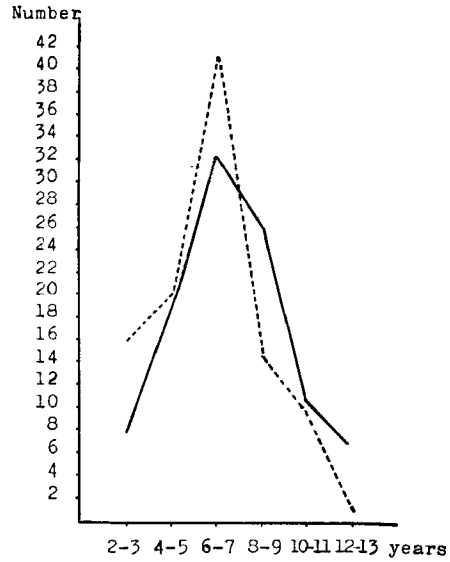

Fig. 1.
Age distribution of coxa plana.
——— age at 1st examination.
- - - - - calculated age at commencement of disease.

If a commencing resorption of earlier densified parts is considered to be the first visualizable evidence of a healing process, the latter will generally be manifestable after an evaluated duration of the pathological process of on an average 16 months. The shortest time registered was as brief as 7 months, the longest being no shorter than 34 months. No definite factor responsible for these great variations could with certainty be determined, although it seemed as if a higher age did, at least in some cases, delay the commencement of the repair processes.

This seems to agree very well with the generally known fact that the regenerative capacity is so much greater in young individuals, e.g. in repair processes after a fracture.

A comparison with the above mentioned epiphyseitis in congenital hip joint dislocations will produce certain evidence in favour of the correctness of the above assumption. The cases of epiphyseitis were generally considerably younger than the coxa plana cases, with an average of 2.7 yrs. $\pm$ 4.1 months. Six of the 22 cases were $= >$ 3 years, the others being 1-3 years old. The highest age was 7 years, the youngest, one year. In the 16 cases in which radiographic pictures permitted one to draw conclusions the average, registered interval between the reposition trauma and the appearance of the first radiographic signs of the commencement of the healing of the epiphyseitis was on an average 8.4 $\pm$ 0.4 months, the shortest being 5 months, the

TABLE

Coxa plana and epiphyseitis at congenital dislocation of the hip joint.

	Coxa plana	Epiphyseitis at reposed congenital dislocation of the hip joint	
Age at 1st examination M + εM n = 103	7,7 years + 2,9 months	Age at reposition M $\pm$ εM n = 22	2,7 years $\pm$ 4,1 months
Calculated age at commencement of disease M $\pm$ εM n = 103	6,6 years $\pm$ 2,8 months	Interval between reposition and epiphyseitis M + εM n = 22	3,7 $\pm$ 0,3 months
Commencement of healing process after M $\pm$ εM n = 49	16,5 $\pm$ 0,7 months	Commencement of healing process after M $\pm$ εM n = 16	8,4 $\pm$ 0,4 months
Healed after M $\pm$ εM n = 22	36,4 $\pm$ 1,8 months	Healed after n = 6	< 24 months

longest, 12 months. There is thus a substantial difference between epiphyseitis and coxa plana as far as the healing tendency is concerned. The duration of the pathological process prior to the commencement of the initial repair stage is twice as long in coxa plana as it is in epiphyseitis. The only factor to which this age differentiation can feasibly be attributed is the very young age and therefore probably better regenerative capacity of the patients.

In the small total of 22 cases in which coxa plana was followed at regular intervals from the beginning, until restitutio with substantially normal bone structure in the caput epiphysis, the average healing time necessary for complete recovery was 36.4 $\pm$ 1.8 months, i.e. a somewhat shorter period than that stated by *Brailsford*. The shortest time was 21 months, the longest, 54 months. If these 22 cases are divided into two groups, one comprising cases under 7 years of age, the other, those over this age, twelve cases will fall within the former group and ten in the latter. The average healing time for those patients over seven years was found to be 38.6 $\pm$ 2.7 months, and for patients younger than seven, somewhat lower, to wit, 35.0 $\pm$ 2.0 months. The difference is small and not statistically significant, but it is possible that it is nevertheless a real difference and that it might be proved significant on more comprehensive material. That such material is not available is due to the fact that the disease is clinically healed long before the radiographic, definitive status of restitutio is attained and that the cases are therefore discharged far too early and not followed sufficiently long at regular intervals.

A comparison with epiphyseitis is of course of interest also with regard to the time it takes the caput femoris epiphysis to heal completely and recover normal bone structure, but unfortunately what was said in the preceding paragraph concerning coxa plana applies also to these cases. Far too few cases have been followed during sufficient time to enable one to make significant comparisons. The six cases of epiphyseitis that had been examined over a sufficiently long period, healed with normal or practically normal bone structure after an average

interval of somewhat less than 2 years after reposition date. The tendency is thus evident. The earlier aseptic necrosis occurs in the life of an individual, the more rapid the healing processes seem to be.

SUMMARY

Coxa plana is not restricted within very narrow age limits. Its appearance shows an evident maximal frequency at the age of about 6 yrs. The average duration of the pathologic process prior to the first medical examination is about one year. The average duration of the disease before radiographic signs indicative of initial repair can be registered is about 16 months, and the average time for definitive, radiographic restitutio is about 3 years. It is possible that the healing process is more rapid in younger children although this could not be proved with certainty in the coxa plana material examined. A comparison with epiphyseitis in repositioned congenital hip joint dislocation, another aseptic necrosis in the caput femoris epiphysis, seems however to show that the rapidity of the healing process accelerates in converse proportion to the advance in the age of the patient.

ZUSAMMENFASSUNG

Coxa plana ist nicht an ein so sehr begrenztes Alter gebunden. Das Auftreten zeigt eine Höchstfrequenz beim Alter von gut 6 Jahren. Die durchschnittliche Dauer des pathologischen Vorganges vor dem ein Arzt aufgesucht wird, ist ungefähr 1 Jahr. Die durchschnittliche Dauer der Krankheit vor dem man die ersten roentgenologischen Heilungszeichen wahrnehmen kann, ist ungefähr 16 Monate. Die für die roentgenologische Heilung notwendige Zeit ist im Durchschnitt gut drei Jahre. Es ist möglich, dass der Heilungsprocess bei den jüngsten Patienten schneller vor sich geht, aber in dem untersuchten Coxa plana Material konnte dies nicht mit Sicherheit bewiesen werden. Ein Vergleich mit Epiphyseonekrose bei reponierten, angeborenen Hüftgelenksluxationen, eine andre aseptische nekrose im Caput Femoris,

scheint jedoch darauf hinzuweisen dass die Heilung schneller vor sich geht, je jünger der Patient ist.

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