

THE INCIDENCE OF CONGENITAL DISLOCATION OF THE HIP AT ISLAND LAKE, MANITOBA*

Cameron Corrigan, B.Sc., M.D.† and
Sydney Segal, B.Sc.‡

Norway House, Man.

ISLAND Lake is situated 150 miles due east of Norway House and 300 miles north-east of Winnipeg. Its eastern tip extends a few miles across the Ontario-Manitoba boundary. It is accessible by water routes either from Hudson's Bay via the Hayes and Nelson River systems or via Lake Winnipeg and the McLaughlin River systems. Of course, today all travel is by air except for snowmobile travel in the winter.

In 1906 the first treaty payments were made to the Indians of the Island Lake region by the Indian Affairs Branch. Indians in the surrounding district, hearing of the payments, came to attend. They came from Red Sucker Lake to the north, Stevenson Lake to the west and the Cobham River system to the east. Thus the Island Lake band is made up of three distinct totems including many different families.

At first they gathered only on the north-west shore at Wasigamak; 449 were present at the first treaty. However, with the coming of first the traders, then the churches, and later the prospectors, they have gradually spread along the shores of Island Lake until they form well established settlements on all shores. In the summer they come to Island Lake to receive treaty, make a garden, some to work or build homes. In the winter most of them scatter to trap and fish, some going hundreds of miles to ancestral trapping grounds.

With the establishment of the churches small settlements grew up with schools and teachers. Medical services were introduced by a beneficent government. The polyglot band increased until today they number 1,253.

The senior author first visited Island Lake in the summer of 1940 to attend as the government doctor at the annual treaty payments. He had never seen so many cripples all gathered together in one place outside of a hospital. It was easy to see that a large number of the cripples

were cases of congenital dislocation of the hip, some bilateral, some unilateral. Some crawled on their hands and knees, some hopped about like clowns, others waddled like ducks. All accepted with typical stoicism their misfortune as life's lot. They knew no different. Nature had exacted another toll. With the crowding together of small settlements, inbreeding and consanguinity were introduced.

In the period 1940-49 a large tuberculosis program was introduced by the Indian Affairs Branch when the obvious cases of tuberculosis were weeded out but it was not until the summer of 1949 that we were able to do a survey of the cases of congenital dislocation of the hip. That summer, at the annual treaty payments, through the facilities of the Manitoba Sanatorium Board, a chest plate was taken of every Indian at Island Lake. At the same time each case of congenital dislocation of the hip had a pelvic plate taken and a systematic examination. The results of these examinations were tabulated as shown later. After a few cases were recorded we were struck by a seeming hereditary tendency of the condition. This led us to plot out a genealogical tree which is also recorded.

History.—Attempts at useful history taking were hampered, not only by the language difficulty, but more seriously by the lack of insight and education on the part of the natives. Thus, while it was reasonable to conclude that the individuals concerned had never walked without a lurch or waddle, some queries were not reliably answered. It was not possible, for instance, to discover whether those afflicted were late in learning how to stand or walk during infancy. This situation was masked still further by the racial custom of keeping young children laced in a moss bag until well beyond the normal walking age, sometimes as late as three years.

Physical examination.—In general appearance, there were obliquity of the hips and asymmetry of the inguinal, labio-femoral and gluteal folds. The incidence of lumbo-sacral lordosis was variable in unilateral cases, but extreme in the bilateral dislocations, with a corresponding protuberance of the abdomen. The wide perineum was another feature of the bilateral cases (see Figs. 4, 5 and 6).

Mensuration was employed in order to show shortening of the lower extremity and displacement of the greater trochanter of the femur in its relation to the anterior superior spine of the

* Based upon an investigation conducted under the auspices of the Indian Health Services, Department of National Health and Welfare, Ottawa.

† Medical Superintendent, Norway House Indian Hospital, Norway House, Manitoba.

‡ Medical Student, Queen's University, Summer Assistant to Dr. C. Corrigan.

TABLE I.
SHORTENING OF THE LOWER EXTREMITY—ATROPHY OF THE THIGH

Part measured	No. hips examined	Measurement		
		Minimum (inches)	Maximum (inches)	Average (inches)
Total limb shortening in unilateral cases	19	¼	2½	1.3
Shortening above Trochanteric level:				
(a) Unilateral cases				
Using Bryant's triangle	20	¼	4	1.4
Using Nelaton's line	20	0	3½	1.5
(b) Bilateral cases				
Using Nelaton's line	20	0	3¾	1.7
Thigh atrophy in unilateral cases approximately	20	0	3¾	1.8

ilium and to the ischial tuberosity. The decreased circumference of arrested thigh development was also measured. These data are given in Table I.

Using Bryant's triangle in unilateral cases, the shortened segment was located above the level of the greater trochanter. The average value of 1.4 inches represented the differences in length of the base of the triangle, that of the affected side being subtracted from the corresponding apparently sound one. In both unilateral and bilateral cases, similar results were obtained by observing the position of the greater trochanter with respect to Nelaton's line. The average displacement was found to be 1.5" in the unilateral and 1.7" in bilateral cases. Some hips that were not dislocated were examined in order to ensure that the trochanter is normally on the line.

Case No. 131 (Fig. 1), right unilateral dislocation with a flexion deformity of the hip, together with a

bilateral dislocation of knee and ankle joints. This cheerful 45-year old Saultoux Indian has never been able to stand or walk. By crawling on heavy moose hide mitts and knee pads, he has become one of the most successful trappers at Island Lake.

Case No. 171 (Figs. 2 and 3), daughter of No. 131 above. This five year old girl also has a right-sided dislocation. On her mother's side of the family, there are an aunt, a great-aunt, two great-uncles and a great-grandfather, all reported to have walked with an abnormal gait since birth. These photographs show Trendelenburg's sign on the right side and its absence on the left. She walked with a lurch to the right. On the right side there were: limb shortening of 1¾", thigh atrophy amounting to approximately 2" in circumference, a thirty degree limitation of abduction of the hip joint, loose passive rotatory movement and telescoping of the thigh. The right femoral head was palpable above, and posterior to, the acetabulum.

Case No. 178 (Figs. 4, 5 and 6), bilateral congenital dislocation in an eight year old. Photographs show the extreme increase of lumbar lordosis with protuberance of the abdomen, the obliquity of the pelvis, the wide perineum, asymmetry of the inguinal and labio-femoral folds and Trendelenburg's sign on the right side. There was also a right-sided lurch in her gait. The following paternal relatives were reported to have walked with a limp suggesting dislocation: an aunt, a great-aunt and a great-grandmother.



Fig. 1

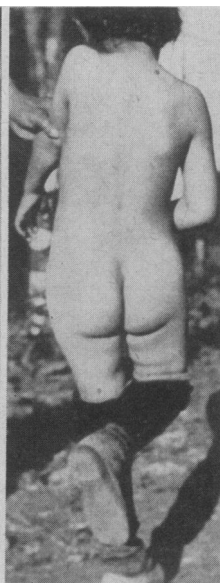


Fig. 2



Fig. 3

In fixing the level on the thigh for measuring the circumference, points on the middle third that were equidistant from the respective anterior superior spine were used. Comparison with the apparently sound side showed a decrease of girth amounting to 1.8", on the average.

Table II shows the distinct decrease in the range of abduction. In order to exclude additional limitation due to arthritic changes, the data obtained in the examination of older sub-

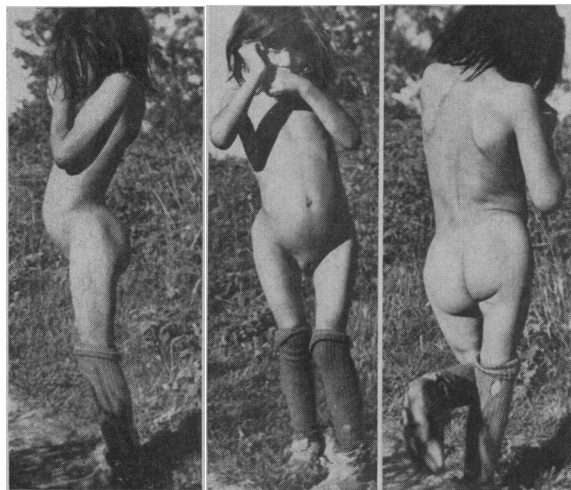


Fig. 4

Fig. 5

Fig. 6

jects were omitted from the calculations. This limit was placed at 35 years, since the range of values became considerably less uniform above this age.

There was a trend toward increased range of adduction. Normally, it was possible to cross the limb of the side under examination at the middle third of the opposite thigh, but no higher. In *unilateral* dislocations, the affected limb could be crossed at the upper third in about 30% of cases, the others showing little change. In *bilateral* dislocations, the changes were not uniform. Passive rotation in both directions

was markedly increased on the affected side in 8 of the 20 unilateral cases examined. In two others, external rotation was nil while in another the limb was fixed in internal rotation. Trendelenburg's sign was present in all unilateral dislocations, with one exception. It was elicited in all bilateral cases. This test is illustrated in Figs. 2 and 3.

Telescopic movement of the affected limb was obtained in six unilateral and four bilateral dislocations. While these were mainly

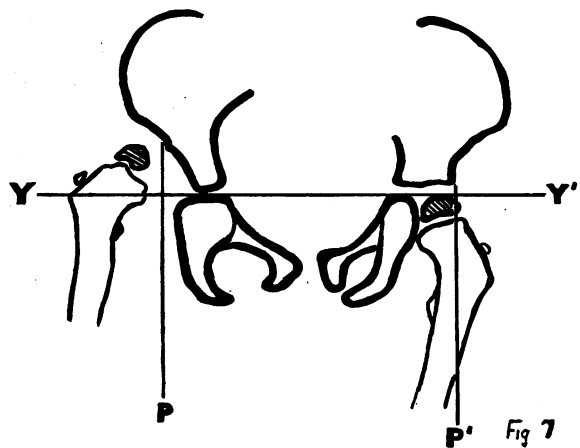


Fig. 7.—Y - Y' is the tri-radiate or "Y" line, drawn through the tri-radiate cartilages at the upper limit of the ischial bones. P and P' are drawn from the outer edge of the roof of the acetabulum. (When the outer edge is effaced, as in acetabular dysplasia, the position of this line where it intersects the "Y" line is found by measuring the distance from the centre of the pelvis to the corresponding perpendicular line on the sound side. The line can now be drawn this same distance from the centre line, which may be represented by the pubic symphysis). Normally, the epiphysis for the head of the femur is in the lower, inner quadrant formed by the intersection of the "Y" line with the perpendicular line on that side. In the case of congenital dislocation, the epiphysis is in the outer, upper quadrant, as shown in the unilateral dislocation above. This diagram was traced from a radiograph of Case No. 167, a three year old female with a left sided dislocation. Her six year old sister has a bilateral dislocation. Her maternal grandfather and his paternal uncle are both reported to have had an abnormal gait.

TABLE II.
RANGE OF ABDUCTION OF THE HIP JOINT
(Hip fully extended)

Condition of hips examined	No. hips examined	Range of abduction		
		Minimum degrees	Maximum degrees	Average degrees
Normal	8	30	45	35.6
Normal side of unilateral dislocations	16	30	60	40.6
Affected side of unilateral dislocations	16	20	30	25.6
(Limitation of range of affected side in unilateral dislocations)	(16)	5	30	(16.4)
Each side of bilateral dislocations	20	20	45	29.0

in the younger age group one 74-year old woman showed at least 2" longitudinal displacement.

Radiography.—Radiography of the pelvis was taken with the subject standing so there was no correction of the increased lumbar lordosis. Bucky screens, stereoscopic films and arthrography were out of the question. Forty-three films showed hip dislocation. The displacement of the femoral head or its epiphysis above the level of the acetabulum was visible in all the radiographs. In the films of infants, the epiphysis for the head of the femur was external to a perpendicular dropped from the outer edge of the acetabular roof, and was situated above the Y line (Fig. 7).

Differential diagnosis.—Differential diagnosis does not usually present any problem. We may consider however; (1) congenital dislocation of the hip; (2) suppurative arthritis, tuberculosis of the hip joint; (3) coxa vara.

Diagnosis is made by radiographic evidence and the presence of an abnormal gait since the very beginning of ambulation.

ETIOLOGY

1. **Nutrition.**—Has not been shown to be a factor.

1. **Race.**—There is a higher incidence of this disease among certain racial groups, notably the Italians. As far as is known this is the first reference to its predominance among North American Indians.

3. **Occupation.**—Likely of no consequences.

4. **Sex.**—Sex has never been shown to be a factor despite the predominance (1 : 6.5) in females (Table III).

5. **Racial customs.**—It has been pointed out above that Indian mothers keep their babies tied up in a moss bag or waspissooan from birth until three years. It has been suggested this continued position of adduction may cause dislocation. This is not likely as the waspissooan is universal, but congenital dislocation of the hip is not.

6. **Birth injury.**—Probably of no significance.

7. **Heredity.**—After a complete set of notes was correlated, family trees were constructed. These included every individual who had been diagnosed as a congenital dislocation of the hip or who had been reported as having a gait characteristic of this affliction. Forebears shown by the family trees to be common to several cases were retained for the final chart while others were not. The time available was insufficient to permit personal verification regarding all of the siblings.

The genealogical chart shown in Fig. 8 includes 70 living persons who are said to walk with a lurch or waddle. Among these are the 44 individuals whose congenital dislocations were diagnosed by examination and/or radiography (Table III). It is interesting to note that the remaining 26 lurchers and waddlers were placed by the native informants in the same category as the 44 who had been diagnosed.

TABLE III.
SEX DISTRIBUTION OF DIAGNOSED CASES

Method of diagnosis	Sex	Number of cases			
		Unilateral		Bilateral	Total
		Left	Right		
Radiological and physical examination	Male	1	2	0	3
	Female	7	8	11	26
Radiological examination only	Male	1	1	1	3
	Female	2	1	8	11
Physical examination only	Male	0	0	0	0
	Female	2	0	0	2
Total diagnosed	Male	2	3	1	6
	Female	11	9	19	39
	Both sexes	13	12	20	45
Ratio	Female : Male	4 : 1		19 : 1	6.5 : 1

Note:—In addition to the above cases there are believed to be another fifty cases at Island Lake which we were not able to contact but which fit into the genealogical tree.

The anomalous gait of the additional 23, shown on the diagram, who are deceased, was described by older members of the community who had known these persons. Whether or not any notice should be taken of a diagnosis that is based upon this sketchy evidence, *it is significant to note that every one of these 94 cases is shown by the chart to be connected by blood relationship.* In other words, a consanguinity has been suggested in 100% of cases, as compared with the 20% reported by many authors.

Analysis of the chart revealed that of the 72 cases whose genealogy could be traced for two generations or more: (a) 33 had a history of this abnormal gait in both the maternal and paternal sides of the family; (b) the maternal side of the family of another was known to be free of the deformity, while the paternal side was affected; (c) the remaining 38 had a definite history of abnormal gait on one side of the family, while adequate information about the other side was lacking.

A study of this blood relationship strongly suggests that the primary etiological consideration is the hereditary one. It is the only factor of those mentioned above that can explain the high incidence of the disease at Island Lake, its restriction to certain families and its absence from the other reserves in northern Manitoba. An exception to this last statement will serve to strengthen the thesis: there are two reserves involved in the nomadic migrations of previous generations of the Island Lake people. These are Oxford House, Manitoba, and Sandy Lake in northern Ontario, close to the Manitoba boundary. Congenital dislocation of the hip has been observed at both these places among persons known to be related to the Island Lakers.

SUMMARY

1. In a population of 1,253 Indians at Island Lake, in Manitoba, a diagnosis of Congenital Dislocation of the Hip has been made in 45

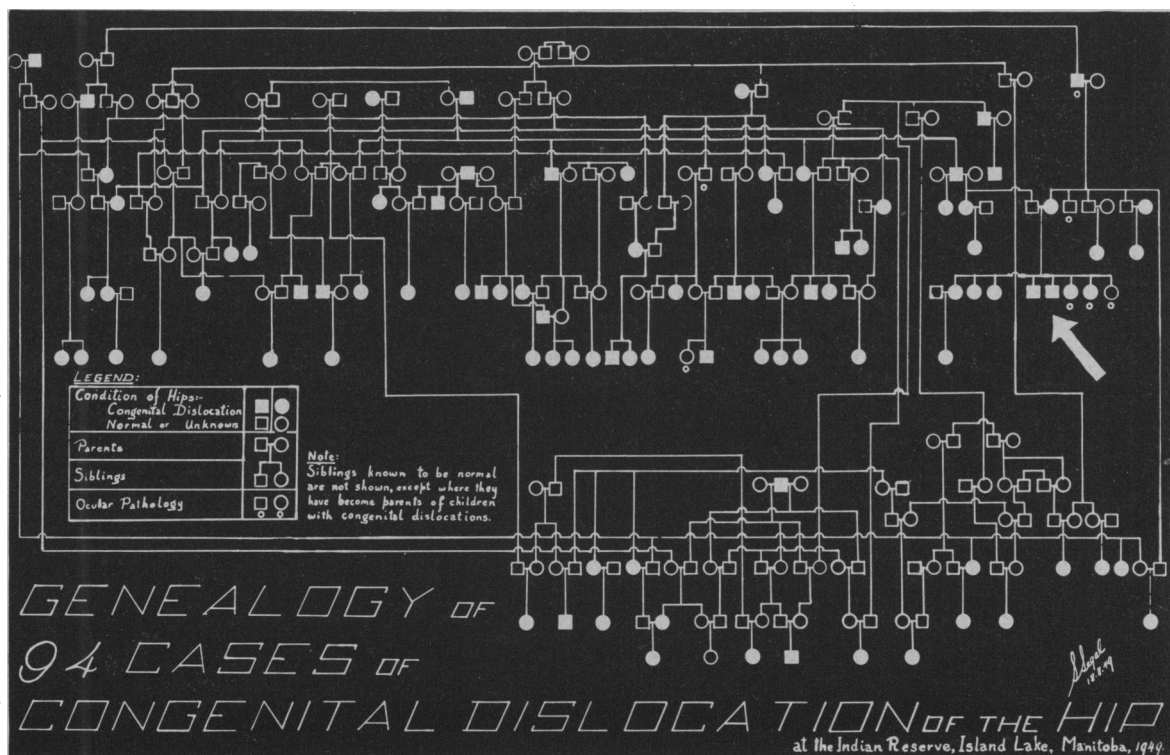


Fig. 8.—Males are represented by squares, females by circles. The incidence of ocular pathology is not within the scope of this paper although it is noted on the chart for other purposes. An example of the interpretation of the chart is shown by following the family marked by the arrow. Here, there are seven affected siblings, two males and five females. The mother and maternal grandfather are affected. The father is not affected but the paternal grandfather was crippled and he had an affected daughter by each of two marriages, and an affected granddaughter by one of them. Looking to the left, it will be seen that this paternal grandfather had an affected sister, an affected brother and his father was also reported crippled.

individuals, ranging in age from two to seventy-four years. There is evidence of other cases that have not been examined, that would bring the total to 71 living persons, representing an incidence of 6%.

2. Diagnosis was made on the basis of a history together with physical examination and/or radiography. X-rays showed the displacement of the femoral head in 43 of the 44 cases. A physical examination was conducted on an unselected group of 31 of those eventually diagnosed, including 29 who had been x-rayed. The physical findings have been described in this paper. The characteristic history is one of a lurching or waddling gait, dating back to the first attempts at walking.

3. The ratio of unilateral to bilateral dislocations was found to be 6:5 in the 45 cases. The proportion of males to females was 1:6.5.

4. A genealogical diagram shows a familial character in the incidence of congenital dislocation in this community. All those who were diagnosed, or suspected of having this disease because of reports of anomalous gait were included, whether presently living or deceased. Thus there are 94 cases, or suspected cases, in the chart.

5. The chart shows that every one of the known or suspected cases of congenital dislocation of the hip at this reserve is connected by blood relationship.

6. Strong presumptive evidence is advanced to show that the primary etiological condition described appears to be the hereditary one.

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ADVANCES IN RADIOTHERAPY

T. A. Watson, M.B., Ch.B., D.M.R.

Saskatoon, Sask.

RADIOTHERAPY is a specialized subject, but since there is no branch of medicine which it does not touch, perhaps a discussion of it would not be out of place. It is a very young science and is constantly changing as new apparatus, materials and experience become available.

X-rays were discovered by Roentgen of the University of Wurzburg on November 8, 1895. Contrary to widespread opinion, this discovery does not seem to have been an accident, but the result of carefully thought out experiments. Roentgen immediately realized the importance of his work and in the short space of six weeks he performed an astonishing number of planned experiments. By the use of fluorescent screens and photographic plates he made fundamental observations with such accuracy and thoroughness that other investigators could add nothing until many years later. On December 28, 1895, Roentgen handed his paper, "On a New Kind of Ray" to the President of Wurzburg University. Strangely enough, the first and only time on which he spoke in public on this subject was January 23, 1896. During this month the news of the discovery spread all over the world with amazing rapidity. The peculiar properties of these rays aroused the public imagination and numerous popular articles, humorous and otherwise, were published.

Concern regarding their use became so great in some quarters, that on February 19, 1895, Assemblyman Reed, of Somerset County, New Jersey, introduced a bill into the House of Trenton, New Jersey, prohibiting the use of x-rays in opera glasses at theatres. In London, England, a manufacturing firm advertised the sale of x-ray proof underclothing. It was reported in New York papers that at the College of Physicians and Surgeons the roentgen rays were used to reflect anatomic diagrams directly into the brains of students.

Interest in the new rays was immediately so great that in 1896 over 1,000 articles and 50 books were published on the subject. The medical application of x-rays were quickly appreciated, but for the first five years x-ray apparatus was more an interesting toy than a