OSTEO-ARTHRITIC PROTRUSION OF THE ACETABULUM (INTRAPELVIC PFANNENVORWÖLBUNG)

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Under this head, an affection of the hip joint has been described which is characterized, anatomically, by a deepening of the acetabular cavity, due to a displacement, medially, of its inner wall, and, clinically, by pain and limitation of abduction and sometimes of adduction and of rotation. It was first described by Otto.¹ It is a rare condition. Valentin and Müller² were able to collect only thirty-one cases, to which they added three of their own.

This condition, as described in the literature, is due to a variety of causes. I am able to present fairly well marked examples of most of the varieties.

CASE 1.—History.—A man, aged 29, complained of pain in both hip joints, which he first noticed ten years previously. It began without known cause or antecedent disease except joint pains in bad weather. At first these pains involved the hands and elbows and later the knees. These joints had not bothered him in recent years. There was at no time any febrile reaction. He had not had tonsillitis; but he had had many decayed teeth, requiring extensive dental work. At the time of examination, however, there was no defect. His general health was good.

The pain in the hips began first about six years previously. It was dull in character and was located deep in the hips. It did not radiate and was never sharp. These pains were more marked in cold, rainy weather. The same kind of pain was present at this time, but the tendency to be worse under certain weather conditions was less marked now than it had been for several years. The pain was most pronounced when he first began to walk after sitting for a time, but lessened with exercise, only to increase again if the exercise was prolonged. This had recently become so marked that he had become incapacitated for all work on the farm. After exercising for a time, the muscles about the hips seemed to become stiff, making movements slow and difficult. He had noticed, a number of years previously, that it was no longer possible for him to ride horseback.

Examination.—The physical examination revealed an apparently vigorous young man. The head and trunk showed no deviation from the normal. The musculature about the hips seemed flabby and slightly atrophic compared with the general appearance of vigor of the upper part of the body. The examination of the legs revealed a degree of flabbiness when compared with the arms.

1. Otto: Pfannenbeckenmiszstaltung infolge deformierender Osteoarthritis. Seltene Beobachtungen zur Anatomie, Physiologie und Pathologie gehörig, Ed. 2, Berlin 1824.

2. Valentin, B., and Müller, H.: Intrapelvine Pfannenvorwölbung (Pelvis Otto-Chrobak), Arch. f. klin. Chir. **117**:523, 1921.

Both trochanters projected a finger's breadth or more about the Nèlaton line. External rotation was distinctly limited, as was also internal rotation to a lesser degree. Abduction was possible only to a very limited extent, not more than 20 degrees, and the attempt to force it caused pain. Adduction was somewhat limited but less so than abduction. Flexion was possible to a right

Fig. 1 (Case 1).—Right hip, showing normal angle of the neck and shaft. The great trochanter lies less than a centimeter from the acetabular brim. The floor of the acetabulum protrudes into the pelvis. The joint surfaces are unaffected and the bone forming the floor of the acetabulum is not changed nor thickened. There is slight lipping of the lower border of the acetabulum.

angle. Within these ranges, the movement was free and painless and without any sensation of friction.

The roentgen ray demonstrated the great trochanters closer to the acetabular rim than normal (Figs. 1 and 2). The acetabulum was free from lipping

or other evidence of disease except at the lower border. The angle of the neck of the femur with the shaft was apparently approximately normal. The striking feature noted in the roentgenogram was that the acetabulum protruded toward the pelvic cavity, deepening it to a marked degree. The acetabular floor was not thickened and the surface it presented toward the pelvic

Fig. 2 (Case 1).—Left hip of the same patient.

cavity was smooth in outline. There was no evidence of disease of the femur nor of the pelvic bones. On rectal examination, the protrusion was more striking than it appeared in the roentgenogram. The sensation was as though half a billiard ball had been cemented over each acetabular region.

Diagnosis.—The slight limitation of external rotation and the marked limitation of abduction at once suggested coxa vara; but the lack of marked limitation of internal rotation made this diagnosis doubtful. The roentgen ray

showed no marked change of the angle of the neck of the femur, but did show a deepening of the acetabulum. The lipping of the lower border of the acetabulum suggested an inflammatory process.

CASE 2.—History.—A woman, aged 44, complained of pain in the left thigh and hip. She had been a strong and healthy child until the age of 6, when she sustained a slight injury of the left hip. She was confined to bed with continuous pain and fever. A sinus formed, but in six months she was able to get about on crutches. The sinus did not heal for nearly eight years.

She had been able to walk with crutches until six months previously, when she injured her hip slightly. She walked about for a week following the injury, but had not attempted to do so since.

Examination.—There was marked limitation of motion in all directions. Abduction was altogether impossible, as was external rotation. The roentgen

Fig. 3.—The entire lateral border is displaced markedly medially, protruding into the pelvis more than a third of its diameter. There is thickening of the bone which forms the floor of the acetabulum. The head of the femur is deformed and the neck and shaft of the femur are atrophied and rarefied.

ray revealed the whole acetabular cavity displaced markedly medially (Fig. 3). The acetabulum was deepened and there were marked changes in the acetabular border and in the neck and head of the femur. In fact, the roentgen ray would indicate a bony ankylosis, an impression heightened by the marked atrophic changes in the femoral shaft and head.

Diagnosis.—The marked median displacement of the entire acetabular cavity constituted the sole reason for including this case in this category. Esau³ reports a case of this type. The clinical findings do not correspond to the true Otto type, so they will be referred to again later.

3. Esau, P.: Akute Osteomyelitis des rechten Schambeins und zentrale pathologische Luxation des Oberschenkels., *Deutsch. Ztschr. f. Chir.* **91**:611, 1908.

CASE 3.—*History*.—A woman, aged 36, came for examination to determine whether an old hip disease would make childbirth hazardous. When 5 years old, she began to have pain in the left hip and knee. She was treated for several years with a hip splint. The pain ceased, but there was limitation of

Fig. 4.—Old tuberculous disease of the hip. There are marked trophic changes in the head and shaft of the femur. The acetabular protrusion is due to a thickening of the bone rather than an actual protrusion.

motion in the hip joint. She was given an anesthetic and the joint was freely mobilized. Following this, she had fever and swelling about the joint for several months, and when this subsided, she was unable to move the thigh at all.

Examination.—There was complete fixation at the hip joint (Fig. 4). The thigh and hip regions showed marked muscular atrophy. The roentgen ray

revealed complete ankylosis. The acetabulum was deepened and protruded into the pelvis. This protrusion was more impressive when examined by the vagina and rectum than it appeared in the roentgenogram.

Diagnosis.—The roentgen-ray findings did not correspond to those usually found in old tuberculous hip disease. However, this apparently is accounted for

Fig. 5.—Extensive carcinomatous metastasis of the ischium. The floor of the acetabulum shows thickening and some displacement.

by the marked inflammatory reaction following the manipulation under ether at a time when the original disease was in abeyance.

CASE 4.—A woman, aged 46, was brought to the hospital because of pain in the back. The details of the history and findings in this patient are of no interest here. She had had one breast removed by a caustic paste two years before, followed a year and a half later by pain in the back. The roentgen

ray revealed many metastatic nodules. It is of interest to note that the metastases in the ischium had permitted a protrusion toward the median line (Fig. 5). The picture is shown here because a similar condition was presented by Thomsen⁴ as a type of osteo-arthritic protrusion of the acetabulum.

COMMENT

Case 1, here presented, seems to belong to a condition wherein the disability is due to the deepening of the acetabular socket, as already noted. It was first described by Otto.¹ As indicated by the title of Otto's paper he considered an inflammatory reaction the causative factor. In several of the cases reported, mild inflammatory reactions have preceded the deformity. Thus Wolfsohn and Brandenstein⁵ report a case in a man, aged 36, who had a rather typical inflammatory rheumatism five years before. Gradually the movements in the hip joint became limited and a protrusion of the acetabular cavity followed. Schertlin⁶ and Henschen⁷ report similar instances. It is to this type that my Case 1 belongs. Most cases recorded apparently follow a coxitis of a relatively mild degree. The general term juvenile osteo-arthritis seems, as suggested by Wolfsohn and Brandenstein,⁵ to be descriptive, except that in the majority of cases recorded the dominant symptoms appeared too late in life to be "juvenile;" it is possible, however, that the first changes began during adolescence.

Eppinger⁸ believes the disturbance is due to a late ossification of the bones making up the acetabular floor. According to him, the constant muscle pressure on the cartilaginous floor is sufficient to produce the condition. Other authors combat this hypothesis chiefly for the reason that a delay in ossification has not been proved, and that the cases reported give histories of a preexisting arthritis.

The significance of frank infections of the joint, particularly by pus organisms, has been emphasized by Esau.³ My Case 2 belongs here. In this case, a pyogenic infection may fairly be assumed. Apparently, a disturbance of the ossification centers followed, with displacement of the horizontal ramus of the pubes. I observed a patient some years ago in whom there was frank suppuration on the right side which was

4. Thomsen: Krebsige Osteomalacie, *Arch. f. klin. Chir.* **13**:235, 1872.

5. Wolfsohn and Brandenstein: Ueber Osteoarthritis coxae juvenilis duplex, *Arch. f. klin. Chir.* **96**:656, 1911.

6. Schertlin: Ueber einen Fall von intrapelviner Vorwölbung und zentraler Wanderung der Hüftpfanne, *Beitr. z. klin. Chir.* **71**:406, 1910.

7. Henschen: Die intrapelvine Vorwölbung und die ventrale Wanderung der Hüftpfanne, *Beitr. z. klin. Chir.* **65**:599, 1909; Die traumatische (spontane) Luxatio centralis femoris, *Beitr. z. klin. Chir.* **62**:294, 1909; Die zentrale oder intrapelvine Pfannenwanderung der Hüfte auf coxitisch-arthropathischer Grundlage, *Ztschr. f. orthop. Chir.* **33**:438, 1913.

8. Eppinger: Pelvis-Chrobak: Coxarthrolisthesis-Becken, *Beitr. z. Geburtsh. u. Gynäk.* **2**:176, 1903.

drained after several weeks. The left side became affected and was drained early. On this side, there is some acetabular protrusion with some changes in the bones. On the right side, the bone changes are extensive (Fig. 6). It is possible that the left side in this case stands midway between the extreme suppuration as shown in the right side

Fig. 6.—At the left of the roentgenogram the head of the femur and the acetabulum show extensive changes. On the right, the femur shows extensive changes; the floor of the acetabulum shows relatively slight changes but protrudes somewhat into the pelvis.

and the type Otto has shown in Figure 1. In another case, with double suppurative arthritis, there was a protrusion of the whole lateral pelvic arches (Fig. 7), being a lesser presentation of the condition shown in Figure 2. In the paper of Valentin and Müller,² they seem to include such cases as of the true Otto type. The gonococcus has been accused by Henschen⁷ and Chiari⁹ to be the cause.

9. Chiari: Ueber die Aetiologie und Pathogenese der intrapelvinen Pfannenprotrusion, Beitr. z. klin. Chir. **102**, 1916.

Tuberculous infection has been observed, notably by Chiari and by Bier. My Case 3 belongs to this group. The deformity here is not great, but it indicates the process by which the deformity develops. Trendelenburg¹⁰ described one due to the echinococcus.

Tabes was diagnosed by Féré,¹¹ Wrede¹² and Kienböck.¹³ In such instances, it appears to be a generalized overproduction, rather than the medial displacement of the floor of the acetabulum.

Fig. 7.—Double suppurative arthritis in a girl, aged 10 years. These joints were both drained. The transverse diameter of the pelvis is lessened and there is some protrusion of the acetabulum. These resemble, in a mild degree, the conditions shown in Figure 3.

Displacement from invasion by tumor was first observed by Thomsen,⁴ and this also was the causative factor noted in one of the

10. Trendelenburg: Echinococcus multilocularis der rechten Beckenhälfte. *Verhandl. d. deutsch. Gesellsch. f. Chir.* **10**:61, 1881.

11. Féré: Description de quelques pièces relatives aux lésions osseuses et articulaires des ataxiques conservées au musée anatomo-pathologique de la Salpêtrière. *Arch. de neurol.* **4**, 1882.

12. Wrede: Demonstration eines Tabesbeckens und eines Otto-Chrobakschen Beckens. Tr. 82 *Versamml. deutsch. Naturf. u. Aerzte in Königsberg*, 1910.

13. Kienböck: Ueber die mit Protrusion des Pfannenbodens einhergehenden Erkrankungen des Hüftgelenks und ihre Beziehungen zur Arthritis gonorrhoeica und Arthropathie bei Tabes. *Fortschr. a. d. Geb. d. Röntgenstrahlen* **18**:280, 1912.

cases reported by Senftleben¹⁴ and by Valentin and Müller.² Numerous other instances have been recorded in which there was a displacement of the head of the femur inward. I had one such instance in sarcoma of the ischium and one in metastatic carcinoma from carcinoma of the breast. This is presented herewith as Case 4.

It seems doubtful whether deformities due to specific infections and to malignant growths should be admitted to this disease group. I would exclude cases due to acute osteomyelitis, tuberculosis, nerve disease and tumors. The course and pathology of these are so different from the typical cases of Otto's disease that confusion is caused by their inclusion. I would, therefore, include only about twenty of the reported cases and Case 1 of my own as typical instances of Otto-Chrobak disease. In this connection, it is not possible to speak convincingly of those associated with gonorrheal arthritis. Schlagenhauser¹⁵ records one instance in which a pure culture of gonococcus was obtained from a case running an acute course. Kienböck likewise reports a case. It may be, therefore, that in some of the cases of insidious onset the gonococcus may have played a part. One cannot, therefore, exclude this etiology from the typical Otto-Chrobak disease.

Viewing the reported cases as a whole, it seems probable that a change in structure of the bone is brought about by a chronic inflammatory process. We cannot do better, therefore, than to conclude with Otto that the disease is due to an osteo-arthritis.

The diagnosis of the typical Otto type is characterized by marked limitation of abduction and external rotation, with a lesser limitation in the other movements. Flexion in Schertlin's case was limited to a third of the usual range. In my case there was slight limitation of flexion. Usually, the greater trochanter is not displaced; but in Schertlin's case there was a displacement of 3 cm. In my case there seems to be some displacement upward, but the range was not above that of personal error.

The clinical importance of this disease, aside from the limitation of motion, is that it sometimes reduces the oblique diameter of the pelvis sufficiently to make it a hindrance to delivery. Henschen⁷ and Kuliga¹⁶ have each made a study of this phase of the subject.

CONCLUSIONS

1. Following a chronic arthritis, there may be a protrusion of the acetabular floor into the pelvic cavity.

14. Senftleben: Ueber Fibroide und Sarkome in chirurgisch-pathologischer Beziehung Arch. f. klin. Chir. **1**:81, 1860.

15. Schlagenhauser, F.: Ueber Coxitis gonorrhoeica und ihre Beziehung zur Protrusion des Pfannenbodens, Zentralbl. f. Gynäk. **30**:228, 1909.

16. Kuliga: Ueber Chrobaksches Becken, Zieglers Beitr. z. path. Anat. u. z. allg. Path. Festschr. f. Arnold, 1905.

2. This produces limitation of abduction and external rotation and some limitation of movement in other directions.

3. This protrusion may shorten the oblique diameter of the pelvic outlet.

4. The displacement of the acetabular floor by specific disease or tumor metastases should not be placed in the group of osteo-arthritic protrusion of the acetabulum of Otto.