A Clinical Lecture ON COXA VALGA.

DELIVERED AT WESTMINSTER HOSPITAL.

By A. H. TUBBY, M.S., F.R.C.S.,

SURGEON TO THE HOSPITAL.

GENTLEMEN,—Deformities of the upper third of the femur have been carefully studied of late years. Fairly complete notices of coxa vara, or depression of the head and neck of the thigh bone, are to be found in works dealing with deformities; but to coxa valga comparatively little

Fig. 1.—Normal femur. Angle CEB, angle of inclination or angle of depression; KHE, Alsborg's angle of elevation; triangle KHE, Alsborg's triangle.

attention has been directed. It is well that I should make clear to you the nomenclature. If we accept that convention of a varus deformity as one in which the segment of the limb distal to the curve or deviation is found to be adducted, then we call that form of bending of the neck of the femur in which the head is displaced downwards and the shaft of the femur adducted, coxa vara. It therefore

Fig. 2.—A B, Hoffa's line; C D, axis of shaft of femur; angle A B C is Alsborg's angle, or angle of elevation or angle of direction.

follows that coxa valga must be precisely the opposite condition, and in this latter deformity the head of the femur is displaced upwards, and the shaft is abducted. Practically, coxa valga is an opening out of the angle made by the head and neck of the femur with the shaft. Inasmuch as the cardinal signs of coxa vara are adduction of the limb with internal rotation and limitation of abduction, so the

Fig. 3.—Angle of Declination. Femur standing on table, looked at from above down. A B = transverse axis of knee-joint (or line parallel thereto); C D = long axis of neck of femur; D E B = angle of declination, = about 12° normally.

essential signs of coxa valga are abduction, with external rotation and limitation of adduction.

And in order to arrive at a clear conception of the condition of the parts, I must ask you to pay rather close attention to the terminology which is being used. Many of the expressions and measurements have been gradually evolved from the descriptions of coxa vara, and applied to coxa valga.

The angle of inclination (angle of depression), the cervical angle, or angle of the femur, is estimated in the normal femur by drawing one line, A B, through the long axis of the shaft, and another line, C D, through the long axis of the head and neck, these lines being drawn in a frontal plane. We therefore have an angle CEB (Fig. 1), and this is the angle of inclination. It varies from 125° to 128° in the normal femur. Roughly speaking, we may say that any marked increase above 128° represents coxa valga and any marked decrease below 125° represents coxa vara.

Hoffa's Line.—If we draw a line A B, Fig. 2, on a normal femur through the base of the head, at the point where the cartilaginous covering ceases, we have Hoffa's line. This is represented in Fig. 1 by G F and cuts C D at K. Now we come to *Alsborg's triangle*. Reverting to Fig. 1, the triangle made by the lines K H, H E, and E K is

Fig. 4.
Coxa valga. Coxa vara. Normal.
Variations in angle of inclination (Young).

Alsborg's triangle. Next, *Alsborg's angle*, or the angle of direction, or the angle of elevation, is the angle formed by Hoffa's line and the line continued up from the diaphysis, indicated by the lines K H and H E in Fig. 1, and by A B, B C in Fig. 2. Alsborg's angle is normally from 41° to 44° .

The Angle of Declination.—Coxa vara is not a simple change of direction in the parts. Not only do we see depression of the head and the neck of the femur, but there is also a distinct curvature forwards or backwards of the neck. The angle of declination is measured in the following way: A femur is stood vertically on the table, and looked at from above downwards. A line, A B, Fig. 3, is drawn through the transverse axis of the knee-joint, and a line, C D, is drawn through the long axis of the head and neck. The angle D E B is the angle of declination, and is normally 12° . It is increased in some forms of coxa vara and in congenital dislocation. We may suspect that, when we know more fully the pathology of coxa valga, we shall find not only elevation of the head and neck, but also curvature forwards or backwards, or even, as is described

Fig. 5.
Coxa valga. Normal. Coxa vara.
Variations in Alsborg's angle, A.

in some cases of coxa vara, a torsion of the neck upon itself.

In our discussion on coxa valga we shall find it simpler, however, to deal with one measurement, the angle of inclination, or, for brevity's sake, the angle of the femur. I purposely avoid using the expression "angle of depression" in relation to coxa valga, because the head of the femur is elevated, and not depressed. In speaking of coxa

vara, the term "angle of depression" is useful, because the affected parts are lowered. In some cases of coxa valga the angle of inclination may be so much increased that in x-ray pictures, taken with the limb everted, the neck of the femur may appear to be in a continuous line with the shaft. (See Cases I and II, Figs. 6 and 7.)

Before describing the pathogenesis of the affection it will be well to discuss the etiology and causation.

ETIOLOGY AND CAUSATION.

So far as the collected cases go, we may classify them in

Fig. 6.—Congenital dislocation and coxa valga. Left hip (Case I).

the following way: A, congenital. The deformity may be found either (a) in conjunction with congenital dislocation of the hip, or (b) existing *sui generis*.

A.—CONGENITAL.

With regard to (a) association with congenital dislocation of the hip. The outlines (Figs. 6, 7, and 8)

Fig. 7.—Congenital dislocation and coxa valga. Left hip (Case II).

taken from the x-ray pictures of Nos. I, II, and III of my cases show coxa valga quite clearly. This co-existence is of great clinical importance, particularly in the treatment of congenital dislocation. The question naturally arises whether the coxa valga in these cases is primary or secondary. We do not know if the head has slipped out either before, during, or after birth; because the upper part of the femur being so

straight, only a small portion of the head is placed in the cotyloid cavity. Or it may be that the coxa valga is secondary to dislocation, and is caused by the outward thrust of the pelvis, in walking, against the femoral head; such an outward thrust must necessarily cause a constant strain on the epiphysial line of the neck, and deflects the head upwards and outwards.

Fig. 8.—Congenital dislocation and coxa valga. Left hip (Case III).

We have not a sufficient number of observations to settle these points, but the indisputable fact remains that congenital dislocation and coxa valga are sometimes combined, and it serves to explain why there is so much difficulty not only in reducing the dislocation, but also in retaining the head of the femur in the cotyloid cavity in some cases. Personally, I suspect that in those cases of congenital dislocation where the lower limbs must be put in what is called the axillary position, or with the bent knee pointing well upwards towards the corresponding

Fig. 9.—Coxa valga, right hip, associated with infantile paralysis. Right foot everted to 45° (Case IV).

axilla, so as to retain the head of the femur securely, there must be a considerable degree of coxa valga.

As illustrating the association of congenital dislocation of the hip and coxa valga, the following cases have come under my notice:

CASE I. *Congenital Dislocation of the Hip and Coxa Valga.*—G.M., female, aged 2½ years, came to the Royal National Orthopaedic Hospital in October, 1905. She halted on the left hip, and

the left limb was smaller than the right, especially above the knee. As she stood, the body was deviated towards the left side. The left trochanter was prominent, and the head of the bone was displaced upward. The spine was not curved, but Trendelenburg's sign was present. We shall refer again to Trendelenburg's sign, which is absent as a rule in coxa valga. But the presence of it in this case was due to the dislocation of the hip, which masks the signs of coxa valga. The limb was externally rotated, but not abducted. All the movements of the limbs were very free.

Measurements.

	Right.	Left.
Umbilicus to internal malleolus ...	17½ in.	16½ in.
Anterior superior spine to internal malleolus ...	16½ in.	15½ in.
Nélaton's line ...	Normal	Left trochanter 1½ in. above

A skiagram (No. 1) taken with both feet slightly everted shows the dislocation of the left hip, and the angle of inclination on that side is 169° and on the right side 126°. (Fig. 6.)

CASE II. *Congenital Dislocation of the Left Hip with Coxa Valga.*—L. M., male, aged 12 months, was admitted to the Royal National Orthopaedic Hospital on January 21st, 1907, for congenital dislocation of the left hip. He is the second child of a family of three, who are all under my care for this affection. The first and third child are females. In the case of the male patient the hip was reduced by manipulation and put up in plaster. On October 25th, 1907, x-ray photographs were taken, of which a tracing (Fig. 7) is made. The head of the left hip is now in the acetabulum. The angles of inclination are as follows: On the left side 172°, on the right side 164°, the legs lying loose and in their usual position. The great increase in the angle of inclination on the left side shows that in this patient, and probably in the children of this family, the upper end of the femur is of such a shape as to cause the head of the thigh bone to be only partially and insecurely placed in the acetabulum, and it therefore slips out under slight provocation.

CASE III. *Congenital Dislocation of the Left Hip with Coxa Valga.*—H. S., female, aged 2 years, was admitted to the Evelina Hospital for Children under my care on October 29th, 1903. The left limb was ½ in. shorter than the right, and flexion, adduction, and abduction were limited.

On December 1st, 1903, the Hoffa-Lorenz open operation was performed on the left hip. The capsule of the joint was from ½ in. to ¾ in. thick. It was opened by a crucial incision, and at the same time particular care was taken to divide freely the lower part of the capsule of and the ilio-psoas tendon. On examination the acetabulum was found to be of good shape, and not unduly shallow. No difficulty was experienced in placing the head of the bone in the socket so long as the limb was held abducted at an angle of 40°; with any decrease in this angle the head slipped out. When the patient was seen on December 15th, 1904, the legs were equal in length, she could flex the limb to 45°, abduction was excellent, adduction was limited, but extension was complete. There was no telescoping of the head of the femur, and it appeared to be in good position and quite firm. The foot was not everted. On June 22nd, 1905, the head of the femur was still in the normal position, and she was seen to walk well. An x-ray photograph (No. II) was taken on January 6th, 1907. The head of the left femur was seen to be thoroughly well placed in the acetabulum, but the upper and posterior part of the rim was not so well defined as on the right side, and about one-third of the sphere of the head of the femur was not embraced by the cotyloid cavity. The angle of inclination of the left femur was 154°, and the right 147° (Fig. 8). This case is interesting, as it is one of the few successful cases in which I have been able to reduce the head of the bone by open operation without it subsequently slipping out in walking. In this case the head has remained firmly implanted in the acetabulum for four and a half years, and for the last two years she has had complete freedom of the limb in every direction except adduction.

(b) *Coxa Valga existing sui generis.*—We must remember that physiologically the angle of inclination may be increased to 140° without definite symptoms following. David published a case of coxa valga which he assumed to be congenital, but evidence in his case is not conclusive. J. K. Young is responsible for this subdivision of the congenital variety in which no other abnormality is present. With the object of determining the existence of this particular form of coxa valga, I may be permitted to refer to an observation of Galeazzi. He has noted that the direction of the normal epiphysial line is absolutely parallel to the plane of the aperture of the normal cotyloid cavity. If further observations are made on fetuses and the newly-born, bearing this statement of Galeazzi's in mind and using it as the basis of measurement, it is possible that other cases of idiopathic coxa valga will be found.

B.—ACQUIRED.

(1) *Coxa Valga arising from Traction exerted by a Pendent Limb.*

It is readily conceivable, Gentlemen, that the united effects of continuous traction by the weight of the part, the loss of the pressure of the body weight from above, and the absence or diminution of the normally strong

contractions of the pelvi-femoral and pelvi-trochanteric muscles may lead to coxa valga. Now these conditions are all, more or less, met with in cases of marked infantile paralysis. They may also exist when the limb has been inactive over a long period. Specimens and cases of coxa valga in infantile paralysis of the lower extremity have been described and recorded by Humphry, Turner, Lauenstein, and Young, and I now show you a patient who has been in this hospital.

CASE IV. *Right-sided Coxa Valga associated with Infantile Paralysis.*—P. S., male, aged 9 years, was admitted to Westminster Hospital on November 15th, 1907, on account of infantile paralysis

Left. Right.
Skiagram No. I.—Congenital dislocation and coxa valga. Left hip (Case I).

of the right leg, which had existed since the age of 2 years. There was extreme atrophy of the muscles in the gluteal region, in the thigh, and leg. No congenital defects were observable, and there was no history of injury, rickets, or tubercle. The patient was an anaemic and underfed boy; he was unable to walk without support, and when he used crutches the right thigh was flexed on the abdomen to an angle of 40°, and the leg flexed on the thigh to an angle of 30°, while the foot was extended and everted. His back showed a double scoliotic curve, the dorsal deviation being to the left, and the lumbar to the right. There was also marked lordosis. The right side of the pelvis was twisted, so that the right anterior superior spine was on a plane lower and posterior to the left. There was also some genu valgum on the right side, and contraction of the tensor vaginae femoris and ilio-tibial band was noticeable. R. D. was present in all the muscles of the right leg, and the patient had no power of voluntary movement in that limb. As he lay in bed the right limb was flexed at the thigh and knee, and it fell inwards. Measurements were taken of the limbs:

	Right.	Left.
Anterior superior spine to knee ...	11½ in.	12½ in.
Knee to external malleolus ...	9½ in.	10½ in.
Great trochanter ...	½ in. above Nélaton's line	Normal

On passive movement of the limbs, it was noticed that the movements of the right hip were unusually free, except when limited by contraction of the ilio-tibial band. The thigh could be fully flexed, and, when it was rotated downward and outward through a wide area, the head of the bone was felt to slip upward, as if subluxated. The patient was put into bed with

weight extension. It was noted that the right trochanter was $\frac{1}{2}$ in. posterior to its normal position, and its external aspect looked somewhat backward. Trendelenburg's sign, or its reverse, could not be obtained, as the patient was unable to stand. X-ray photographs of the limbs were taken in the following positions: (1) As the patient lay upon the couch—that is, with the right foot everted to an angle of about 45° . The angle of inclination on the right side was found to be 170° , and on the left 144° (Fig. 9). (2) With both feet placed parallel, the angle of inclination was found to be 150° on the right side, and on the left 143° (Fig. 10). (3) With both feet fully everted, and the limbs abducted, the angle of inclination on the right side was 204° , and on the left 160° . (4) With both feet fully inverted the angle of inclination on the right side appeared to be 128° , and on the left 135° (Fig. 11). That is to say, on the right side, between the fully inverted and fully everted positions there were 76° of difference, and on the left 27° of difference. These observations show not only the possibility of fallacies in examining these cases unless x-ray photographs are taken in all positions, but they show also in this case the extraordinary elevation and twisting of the neck which must have taken place in the right femur to allow of such wide rotation as through an arc of 76° . With regard to treatment of this case, section of contracted bands of fascia was done, and the boy was supplied with an apparatus for walking, which took its bearing from the ischial tuberosity, and transmitted the weight of the body directly to the boot. In this case it was useless to attempt any other treatment except persistent massage and galvanism. If, however, any recovery of muscles takes place, the patient will be readmitted, and the propriety of tendon grafting and arthrodesis will be considered.

Coxa valga also occurs in the stump after amputation through the thigh in early childhood where the stump is pendent. Unless an artificial limb is fitted so that weight is borne, the pendent position of the stump results in opening out the angle of the neck, so that coxa valga follows.

(2) Static or Functional Varieties.

Some years ago Julius Wolff enunciated a law which harmonizes many of the apparently divergent conditions seen in deformities. If we put it briefly, his law is: The shape of the bones is determined by conditions of reaction of the bones in structure and shape to the body weight, and to the stress and strain of muscular action. You will therefore see, gentlemen, that a femur performing its functions in an adducted position will eventually assume a different shape from one which works in an abducted position. So that in tilting of the pelvis differences in the shape of the thigh bones are to be anticipated. When the centre of gravity of the trunk is disturbed, as in scoliosis, the femur will be subjected to different conditions of stress and strain, due to unequal loading. Now, unloading, or loss of the normal load, is just as much a static condition as overloading. It is, as it were, a negative phase, and conditions of this nature must be taken into account in explaining some cases of coxa valga. Thus, for example, genu valgum on one side is associated with coxa vara on the same side, and coxa valga on the other.¹ When a patient is partially paralysed in one lower extremity, he leans on it, and the pelvis is tilted downward on that side. The affected limb is therefore abducted, and, as Galeazzi has shown, coxa valga results. We may go further and assume that if, on the converse, in such a case the femoral neck had been deficient in resistance, it would have collapsed and coxa vara resulted.

A case of what may be termed compensatory coxa valga from fracture of the shaft of the femur came under my notice at the Royal National Orthopaedic Hospital.

CASE V. *Right Coxa Valga following Fracture and Mal-Union of the Shaft of the Femur.*—G. M., male, aged 8 years, was seen by me on July 18th, 1907, on account of lameness in the right leg. In October, 1906, he was run over by a motor car, and was taken to the Hackney Union Infirmary. The right thigh was considerably crushed, and he remained in the infirmary until Christmas. Subsequently he was seen there again, and then came on to us. The child is a pale, undersized boy, and stands with the right leg bowed out, and there is an extensive outward curve in the shaft of the right femur. The right trochanter has lost its natural prominence, which is replaced by a marked depression, and the external surface of the trochanter looks backwards. There is no scoliosis, and Trendelenburg's sign is reversed. On walking, he limps, but has no pain. The limb is rotated outwardly, but abduction is not marked. When he lies down, flexion at the right hip is normal. Abduction can be carried to an angle of 45° , adduction to 20° , external rotation to 30° , and internal rotation is free only when the thigh is flexed.

Measurements.

	Right.	Left.
Umbilicus to internal malleolus ...	27 in.	27½ in.
Anterior superior spine to internal malleolus ...	24 in.	25 in.
Nélaton's line ...	Trochanter normal	Trochanter ½ in. above

An x-ray photograph (No. III) was taken of the right leg, with the foot to the front, and the angle of inclination of the neck of the femur was found to be 152° (Fig. 12). So far as treatment is concerned, the obvious thing to do is to remedy the mal-union of the femur by operation.

The connexion between genu valgum and coxa valga is illustrated by the following case, which came into Westminster Hospital on December 6th, 1907:

CASE VI. *Genu Valgum and Coxa Valga.*—C. M., male, aged 11 years, was admitted for malformation of both hips. The only point in the history is that there has been a difficulty in progression since the child began to walk. There is no history of tubercle, injury, paralysis, or rickets, and no congenital defects are noticeable. The patient is a feeble

boy, and stands and walks on a wide base, with the feet apart and the knees together. Both feet are flat. He has slight scoliosis, with the convexity of the lumbar curve to the left. On walking, he rolls about but does not limp. The pelvis drops to the right side, and there is slight lordosis. The right trochanter is not so prominent as the left. The left leg showed external rotation, and the distance between the malleoli with the knees $\frac{1}{2}$ in. apart is, when he stands, $5\frac{1}{2}$ in.; when he lies down $4\frac{1}{2}$ in. The measurements are as follows:

	Right.	Left.
Umbilicus to internal malleolus...	25½ in.	25½ in.
Anterior superior spine to internal malleolus ...	24½ in.	24½ in.
Trochanter ...	½ in. above Nélaton's line	Normal but displaced slightly backwards

Trendelenburg's sign is absent on both sides as they are tested alternately.

Passive Movements.—With the limbs extended, abduction on the right side is 40° , adduction 20° . On the left side, abduction is free to the right angle, adduction is limited to 5° . With the thighs and knees flexed: On the right side abduction is very free, and adduction is good; on the left side abduction is very free, and adduction is limited. On fully flexing both thighs simultaneously the femora were rotated outwards. It was also noted that the head of the femur on the right side appeared to be unduly movable in the acetabulum.

Left. Right.
Skiagram No. II.—Cured congenital dislocation, left hip and coxa valga (Case III).

Skiagrams were taken in three positions: First, with the patient lying as he was accustomed to do, when the angle of inclination on the right side was found to be 150° and on the left side 155° (Fig. 13). The feet were then fully inverted, and the angle on the right side was 130° , and on the left 137° (Fig. 14). The limbs were then fully turned out, the angle on the right side was 163° , and on the left 170° (Fig. 15).

As to the treatment of this case, the proper thing to do is to relieve the genu valgum, and note the effect on the angle of inclination.

(3) *Traumatic Coxa Valga.*

The deformity arises after fracture of the neck of the femur, with impaction and mal-union, and after injuries and separation of the epiphysis. Various observers have stated that the lesion can be produced by a direct fall or blow on the trochanter, and a case quoted by Drehmann² is of interest in this connexion, because it showed an impacted fracture of the femur, coxa valga, and an angle of inclination of 155° , which gave rise to $2\frac{1}{2}$ cm. lengthening of the limb.

This case affords one interpretation of a fact noticed in general surgical textbooks, that occasionally actual lengthening may result from fractures in the neighbourhood of the hip-joint.

(4) *Coxa Valga associated with Rickets or other Processes of Bony Softening, such as Osteomyelitis and Tubercle.*

Some authors speak of a rachitic form of coxa valga, but as a primary affection it is almost inconceivable. It is well known that if the neck of the femur is soft, it will bend downwards, and coxa vara (not coxa valga) will result. When coxa valga occurs in rickets it is associated with an inward bend of the lower part of the shaft of the femur, as in the case of fracture quoted above. And then, as a compensatory condition, coxa valga has developed. So that the femoral head is in a line with the upper part of the curved shaft. Tilanus³ gives details and figures of a case of compensatory coxa valga.

(5) *Idiopathic.*

As to the existence of this form considerable doubt must be expressed, and when the examples are inquired into, they resolve themselves into either static or congenital cases.

Pathogenesis.—Much light is thrown on this point by the remarks on causation, but a few words may be added. The normal shape and position of the head and neck of the femur depend on the nice adjustment of certain forces—namely, weight-pressure, resistance of the bone to this pressure, and muscular effort. If any one of these factors, or all of them, are varied in degree, altered in direction, or destroyed, changes take place conformably with Wolff's law, and the head and neck of the femur assume different positions and directions. These results are best exemplified in coxa vara. Now, let us suppose that the limb is

pendulous, then the effects of the downward pressure of the weight of the body above are lost, and the weight of the limb below drags upon the neck of the femur, and gradually opens out the angle of inclination.

And this, gentlemen, leads me to remark on the treatment of fracture of the neck of the femur. If extension by weights is used, great care should be taken that the limbs are placed parallel, and a proper amount of weight is employed. If too much, the shaft of the femur will be dragged too far down, and the head and neck will unite at a very obtuse angle, so that coxa valga will be produced. If too little weight is used, the opposite condition, coxa vara, will follow. Therefore, every such case should be examined through the screen from time to time, so as to ascertain that the parts are in the best possible position.

In congenital dislocation, when the head is displaced upwards, the thrust of the pelvis downward and outward in walking, in unilateral cases, must naturally cause the angle of inclination to open out. In scoliosis there is no doubt that coxa valga develops on that side towards which the pelvis inclines. But further observations by means of x rays are needed to ascertain if coxa vara on the opposite side is always associated.

As to the occurrence of coxa valga in rickets, it is difficult to explain the connexion. The opposite deformity, coxa vara, is easily explicable and rational. But, as we have remarked above, rickety coxa valga as a primary deformity must be excessively rare. When it occurs secondarily to some other deformity, such as genu valgum, static conditions are the primary causes.

SYMPTOMS AND SIGNS.

The cardinal signs are abduction of one or both lower extremities, associated with ex-

ternal rotation and limitation of adduction. The following is a brief description:

1. *Pain and Spasm.*—At the onset of the trouble the patient often experiences fatigue, wandering pains in and about the hip joints, and sometimes the abductor muscles are seen to be in spasm.

2. *Gait.*—In a unilateral case there is limping, and the trunk is inclined toward the affected side. In bilateral cases it is rolling, sailor-like, and unsteady, and is reminiscent of the walk in congenital dislocation. The cause of the unsteadiness and the uncertainty is due to the fact that the head of the femur is not wholly and firmly planted in the acetabulum; for frequently it happens that the inner and upper portion only of the convexity of the sphere lies in the cotyloid cavity. In some cases a partial subluxation occurs in walking; and if, when the patient is lying supine, the limb is flexed, abducted, and rotated outward, a distinct slip upwards of the head may be felt.

3. *Lengthening of the Limb.*—In a unilateral case, the limb is lengthened two or three centimetres, and tilting up of the pelvis on that side does not compensate

Skiagram No. III.—Coxa valga at hip, following mal-union of the femur (Case v).

for the increased length. In fact it may be necessary, in order to bring the limbs parallel, to compensate on the sound side.

4. The limb is abducted and rotated outward, while movements of adduction and inward rotation are limited. This is said to be pathognomonic. There is often some limitation of flexion. It is to be noted that adduction of the limb does not compensate for the increased lengthening.

5. In bilateral cases the patient stands on one leg with difficulty. In unilateral cases, when the patient stands on the affected limb the body is inclined toward the

Fig. 10.—Right coxa valga in Case IV. Feet parallel.

affected side. And this posture is exactly the opposite of that which obtains in Trendelenburg's sign, such as is often seen in congenital dislocation of the hip. In the latter case, when the patient stands on the affected limb the pelvis drops to the opposite side.

6. Compensatory changes occur in the trunk. In unilateral cases the upper part of the body is inclined toward the affected side, and lumbar scoliosis is present, with its convexity toward the affected limb. Sometimes the pelvis is twisted, so that the anterior superior spine on the affected side is below and in front of its fellow.

Fig. 11.—Right coxa valga in Case IV. Feet fully inverted.

7. The region over the great trochanter is often flattened. This is in marked contrast to the prominence in congenital dislocation. In coxa valga the trochanter is often below Nélaton's line, and its outer surface looks somewhat backward. This rotation backward of the outer surface points to the probable existence in this deformity not only of increase in the angle of inclination of the femur, but also to incurvature of the neck, as in coxa vara. There may also exist some torsion of the neck upon itself, but no observations exist on this point. The lowering of the great trochanter is not observed if the acetabulum is unduly widened, nor if the case is complicated by congenital dislocation of the femur or is associated with infantile paralysis.

8. The last word rests with careful skiagraphy, and we find that all the cases described as coxa valga will not bear close analysis. In taking skiagrams the position of the limb must be carefully noted in each case. Thus, in a

Fig. 12.—Coxa valga following fracture and mal-union of shaft of femur (Case V).

case of coxa vara, if the femur is rotated outward through 90°, the case will appear as one of coxa valga. That is to say, the further we deviate from a plane transecting the femoral neck frontally, the more valgoid will the neck appear. There are, however, two means of avoiding this fallacy. First, we should be certain that we see the anterior edge of both trochanters clearly in the skiagram. Secondly, the better test is that which I have adopted of having the photograph taken in at least three positions of the limbs—namely, with both feet fully inverted, both feet straight to the front, and both feet fully everted. If th

Fig. 13.—Bilateral coxa valga associated with genu valgum (Case VI). Feet slightly everted.

appearance of coxa valga is seen in all three positions, and if the measurements of the angle of inclination are in each instance excessive, then, I take it, there is no doubt of the existence of the deformity. An excellent method is to take the x-ray photograph stereoscopically and have a reduction made. It is necessary that at each exposure the tube be kept in the same relative position to the body. In photographing young children it is wiser to give an anaesthetic.

Some of the records in literature, so far as the angles of deviation are concerned, are vitiated by the absence of due precautions, and I strongly suspect that, relying too much on imperfect x-ray work, some cases have been wrongly designated coxa valga.

DIAGNOSIS.

The cardinal and other symptoms have been already dwelt upon, but in the various types of cases some of the signs are seen to be modified. Thus, shortening of a limb, rather than lengthening, exists in congenital dislocation and infantile paralysis. Again, the movements of adduction may be very free in paralytic cases. Further, the trochanter is raised, and not lowered, when coxa valga is associated with congenital dislocation. And here, too, the trochanter is also prominent. In some cases the trochanter is rotated backwards, and then incurvation of the neck of the femur is probably present.

The chief cause of error is confusing an incipient tuberculous coxitis with coxa valga. But this can be readily

Fig. 14.—Another outline of the hips in Case VI. Feet inverted.

avoided if we remember that in the latter condition upward tilting of the pelvis does not compensate for the lengthening of the limb. In sacro-iliac disease, on account of the abducted position of the limb and apparent lengthening and dropping of one side of the pelvis, some confusion may arise, but the local pain and disability in sacro-iliac disease are sufficiently well marked.

TREATMENT.

The subject has hitherto received such scanty notice that no definite lines of treatment have been laid down. Independently I treated a case by placing the limb as far as possible in the adducted position, and found afterwards

Fig. 15.—Outline of hips in Case VI. Feet fully everted.

that the same plan had been adopted by David. After the adduction of the limb it was placed in a plaster-of-Paris spica. David succeeded in improving the angle of depression in his case by 7°, but I cannot say that I met with any success. In some cases the equalization of the limbs by the use of a high sole on the sound side will not only improve the gait, but will lessen the angle of inclination by changing the direction of weight-pressure.

Wallace Blanchard devised a cuneiform osteotomy of the neck of the femur, but this is not an easy performance, and the success of the after-treatment is more problematical than in subtrochanteric osteotomy.

Arguing from the analogy of coxa vara, where the

deformity is readily remedied by the removal of a wedge of bone with its base outwards in the subtrochanteric region, it ought to be the right thing in coxa valga to remove a wedge with its base inwards. This, however, may be a troublesome proceeding, on account of the immediate proximity of the vessels, particularly the internal circumflex and superior perforating arteries. Galeazzi has obtained good results in his cases by performing a linear osteotomy well outside the joint, and at the base of the neck. He is convinced that in all anomalies of direction of neck the proper site of operation is here, and not in the subtrochanteric region. He has further pointed out that if the section is made at the spot indicated the pull of the great muscular masses, whose tendons are inserted into the great trochanter, is to drag the shaft of the femur upwards and lessen the angle of inclination. Afterwards he applies sufficient traction to the leg to prevent great displacement of the fragments without limiting the gradual ascent of the trochanter. He also follows step by step, by means of x-ray photographs, this upward movement of the trochanter, and he stops it at the proper moment by means of a firm plaster-of-Paris spica. According to his figures, his treatment is successful. Nathaniel Allison divided the bone just below the trochanter, and remedied the external rotation and abduction, and caused the angle of inclination to be diminished.

Personally, gentlemen, I give the preference to Galeazzi's method, provided that the ascent of the trochanter is carefully watched, and arrested at the right moment.

REFERENCES.

¹ Cf. Remarks by Galeazzi, The Scoliosis and Coxa Valga in Maclaure's Case, and in the Case of Genu Valgum of Gangolphi. ² *Zeits. f. Orth. Chir.*, Bd. xvii. ³ *Revue d'Orthopédie*, March 1st, 1907.

BIBLIOGRAPHY.

- Humphry, Sir George: Observations on the Angle of the Thigh *Journ. of Anat. and Phys.*, 1888, xxiii.
Albert: Zur Lehre von der sogenannten Coxa Vara und Valga. Wien, 1889.
Turner: Ueber Coxa Valga. *Zeitsch. f. Orth.*, B. xiii, 1904, p. 1.
Lauenstein: *Arch. f. klin. Chir.*, 1890.
Maclaure: Coxa Valga et Scoliotique. *Bull. Méd.*, 1895.
Hofmeister: Coxa Valga. *Beitr. z. klin. Chir.*, B. xii, S. 245.
Theim: *Handb. d. Unfälle Krankheiten*, 1898, S. 225.
Hoffa: *Lehrbuch d. Fracturen u. Luxationen*, 1904, S. 410.
Reichardt: *Klin. Beitr. Lehre von der Coxa Valga*. XXX Kongress z. Berlin, 1901, p. 192.
Hoffa: Sur un cas de Coxa Valga. *Rev. d'Orth.*, 1902, 4.
David: *Beit. z. Frage d. Coxa Valga*. *Monats. f. Chir. u. Phys.*, 1904, No. 5.
Young: *Univ. of Penn. Med. Bull.*, January, 1907, p. 274.
Galeazzi: *Amer. Journ. of Orthoped. Surg.*, IV., p. 244.
Nathaniel Allison: *Ibid.*, v., Oct. 1907, p. 228.
Theim: Schenkelhalsbruch mit Verlängerung des Beines; Coxa Valga Traumatica. *Verhandl. d. Deut. Gesells. f. Chir.*, 1897.
Von Bruns: *Muench. med. Wochens.*, 1905, xxxvi.
Manz: *Beit. f. klin. Chir.*, Bd. xxviii, S. 29.
Young, J. K.: *Amer. Journ. Orthoped. Surg.*, 1907.
Drehmann: *Zeitsch. f. Orth. Chir.*, Bd. xvii, 44.
Bradford and Lovett: *Orthoped. Surg.*, third edition, p. 321.
Tilanus: *Rev. d'Orth.*, March, 1907.
Galeazzi: *Amer. Journ. Orthoped. Surg.*, 1907, p. 245.
Blanchard, Wallace: *Ibid.*, January, 1907.

IN the *Journal of the Royal Institute of Public Health*, May, 1908, p. 264, under the heading A New Field Latrine, there is described a form of latrine in which instead of one long trench there is a series of short trenches placed side by side. This form of latrine has been in use in the Natal Militia for several years, and has stood the test of active service on more than one occasion. In the *Field Service Manual of the Natal Militia Force Medical Corps* it is thus described: "Each trench is to be 6 in. longer than a spade, as broad as the blade of a spade, and at least 3 ft. deep. There should be a space of at least 3 ft. between each trench. The earth removed from each trench is to be carefully heaped up a few inches away from the side of the trench. One trench should be provided for each five men." The system was suggested in Natal by Captain Knowler, N.F.A., in 1903, and has since been adopted in connexion with the Natal Militia.

ACCORDING to the *Gazeta dos Hospitales do Porto*, appendicitis has increased extraordinarily in Russia of late years. Thus, while in 1903 the number of cases were about 8,000, they were next above 10,000 had increased in 1905 to over 13,000, and in 1906 to over 15,000. Against this must be set the decrease in fatality from 9.46 to 6.68 per cent. In Russia the disease attacks males more than females, and is more fatal in children than in adults. In China appendicitis is stated to be exceedingly rare, and the suggestion is again made that this may possibly be connected with the fact that the people are to a great extent vegetarian in diet.