SELECTED REPRINTS AND TRANSLATIONS.

TWO NAEGELE PELVES.*

By J. H. TARGETT, M.S.,
Assistant Obstetric Surgeon to Guy's Hospital.

THE rarity of this form of pelvic contraction is sufficient justification for recording all examples of it, although there may be little to add to the anatomical descriptions which have already been given so fully by Naegele and many subsequent writers. The first specimen (Pelvis A) was removed from a woman who died in Guy's Hospital, and some clinical notes of this case have been preserved; however, no exact diagnosis of the kind of pelvic deformity which existed was made during life, as the patient was extremely ill from obstructed labour and the fœtal head was impacted at the outlet. From the testimony of friends, it may be concluded that she presented no obvious deformity and that her gait was quite normal.

The second specimen (Pelvis B) has been preserved in Guy's Hospital museum for more than fifty years, but there are no records of any kind concerning it. As it is an excellent example of the deformity and exhibits some peculiarities, a full description of the pelvis has been prepared. It is impossible to estimate the frequency of the Naegele pelvis. In the Chrobak Klinik, among 50,000 labours the Naegele pelvis was only once found, though contracted pelvis of other varieties occurred in 3·8 per cent. of the cases. In 38,000 labours at the Royal Maternity of London no case of Naegele pelvis was discovered. And in the Guy's Hospital maternity records, which have been kept since 1833, there is no mention of any case similar to the one related below.

On the other hand, out of a total of 17,000 labours in various American hospitals, Professor Lusk found no less than five cases of Naegele pelvis recorded.

The best collection of cases of difficult labour from this form of pelvic contraction has been made by Dr. Tchérépakhïne, of Paris, in a monograph published in 1893. He records some seventy cases, of which fifty-four are accompanied by clinical histories, and from

* Reprinted, by permission of the editor, from *Guy's Hospital Reports*, vol. lv.

these figures we may gather some idea of the fearful mortality which has attended such labours in the past. It will be admitted that, as most of the cases occurred before the days of antiseptic midwifery, a similar mortality would not obtain in the future; but the frequency of severe complications, such as rupture of the uterus, and the probability that the deformity will not be discovered until difficulties have arisen, combine to make this variety of pelvic contraction one of peculiar interest and importance.

Of the fifty-four cases above referred to, no less than forty-four (80 per cent.) have left their pelves to various museums as the result of gestation. Of these forty-four fatal cases, six died undelivered, thirteen had rupture of the uterus and vagina and died of hæmorrhage or peritonitis, and the remainder succumbed to puerperal septicæmia in one form or another.

The ten women who survived their confinements were delivered by version, forceps, or craniotomy, the operations being attended with considerable difficulty. The majority of them were multiparæ, and had experienced similar difficulties with their previous confinements.

If the results of the previous labours of the whole series of cases (fifty-four in number) be tabulated, we have a list of 112 confinements, and deducting the six cases which died undelivered, as well as seven others, of which the records are incomplete, the modes of termination of 100 labours (including the case recorded below) may be thus stated:

(*a*) Labours ending naturally at term ...	15	(7 cases)
(*b*) Labour ending naturally, but before term	1	(1 ,,)
(*c*) Labours induced and ending naturally ...	7	(3 ,,)
(*d*) Labours induced, but requiring operations	12	(3 ,,)
(*e*) Labours at term ended by forceps ...	21	(17 ,,)
(*f*) Labours at term ended by version ...	6	(5 ,,)
(*g*) Labours at term requiring perforation, craniotomy, etc.	32	(21 ,,)
(*h*) Labours at term—Cæsarean section ...	4	(4 ,,)
(*i*) Labours which presented extreme difficulty	2	(2 ,,)
	100	

It should be noted that with the fifteen labours ending spontaneously at term, only seven women were concerned; for one case was delivered naturally five times, another four times, and another

twice. Similarly, of the three patients in whom labour was induced and ended naturally, one was so delivered five times. The very small proportion of cases in which version at term was successful is significant, and the explanation is not difficult. In addition to the obstruction at the pelvic brim resulting from the ankylosis and oblique contraction, the typical Naegele pelvis exhibits a marked degree of inversion of the ischial spine and tuberosity on the affected side. In consequence the pelvic cavity becomes funnel-shaped, and the obstruction is progressively increased in passing from the brim to the outlet. Both the specimens here described exhibit a high degree of contraction at the pelvic outlet, and owing to the excessive inversion of the ischial spines the sacrum is entirely prevented from taking any share in the formation of the circle which is included between these spines and the walls of the pelvis, on a level with the apex of the pubic arch. Indeed, the outline of the plane of the cavity at this level is in shape like a figure of 8, with unequal loops. Of these loops the posterior, which lies between the ischial spines and the front of the sacrum, is the smaller, and is much flattened from before backwards and obliquely, like the brim; the anterior loop, on the other hand, is considerably larger and rounded. From these considerations it follows that nothing is gained by podalic version, and if the head is already in the pelvic cavity there is the additional risk of injury to the uterus from the operation itself. Cæsarean section at term is now the most suitable method of dealing with these cases provided the child is alive, and the patient must be sterilized at the same time. But if repeated attempts at delivery with forceps have been made, and risks of injury to the mother and child have thus been incurred, it will probably be safer to perform craniotomy. On a subsequent occasion, when the true characters and measurements of the pelvis are known, the choice would lie between induction of premature labour and Cæsarean section. It is particularly important that the distances between the two ischial spines, or the tuberosities, should be measured, and this would be most satisfactorily done under anæsthesia.

The following are the most important measurements of the pelvis, which should be taken on each side and compared:

1. From one anterior superior iliac spine to the opposite posterior superior spine.

2. From both anterior superior spines to the fifth lumbar spine.

3. From one posterior superior spine to the opposite tuber ischii.

4. From one posterior superior spine to the opposite trochanter major.

5. From both posterior superior spines to the fifth lumbar spine.

6. From the lower edge of the symphysis pubis to both posterior superior spines.

7. From the lower edge of the symphysis pubis to both ischiatic spines.

8. From both ischiatic spines to the nearest point on the edge of the sacrum.

9. From the tip of the sacrum to both tubera ischii.

10. From the centre of the promontory of the sacrum to both ilio-pectineal eminences (sacro-cotyloid diameter).

In addition to these, the majority of which are peculiar to the Nægele pelvis, there are the usual external measurements — the interspinous, the intercristal, and the external conjugate—and the various diameters of the pelvic brim, cavity, and outlet. The importance of the interischial and transverse diameter of the outlet has been already mentioned.

Pelvis A.

From a case of difficult labour due to an obliquely contracted (Naegele) pelvis. Delivery by cephalotripsy after repeated applications of the forceps. Death from acute septicæmia and peritonitis, due to rupture of the uterus.

Clinical History.

Charlotte F., aged twenty-four, primipara, was admitted to Guy's Hospital on Tuesday, February 14, 1899. Labour began on Saturday, February 11, and continued until Monday, February 13, at 6 p.m., when forceps was tried, but unsuccessfully. At 9 p.m. the same evening an anæsthetic was given and forceps was again applied. After repeated attempts at extraction it was decided to recommend the removal of the patient to Guy's Hospital; but the friends were at first unwilling, and it was not until Tuesday, February 14, at 6 p.m., that the patient was admitted. She had then been in labour some eighty-four hours.

On Admission.—The patient was very drowsy, with eyes sunken and pupils contracted as though under the influence of opium. Temperature 98·6°, pulse 140-150, small and running. She was evidently in a state of profound septicæmia. The abdomen was extremely tender to touch, and the uterus was closely contracted round the child, though no retraction ring was visible. The uterus felt hard, but varied in that respect, and was not, therefore, in a

condition of absolute tonic contraction. The fœtal heart could not be heard, and owing to the extreme tenderness no further abdominal examination was made. By the vagina, a vertex presentation was felt, covered with a large caput, which was only 1½ inches from the vulva. There was not much œdema of the vulva, but numerous lacerations could be felt in the walls of the vagina. The patient was immediately anæsthetized, the external parts were shaved and thoroughly cleaned, and then craniotomy was performed in the dorsal position without making any trial of forceps. The site of perforation was afterwards found to be just behind the right parietal eminence, so that the presentation had been left occipito-anterior. The brain matter which escaped had a distinctly foul odour. The cephalotribe was applied in the transverse diameter of the pelvis, and the grip obtained was so good that it was unnecessary to change the position of the instrument. The head was slowly delivered in the antero-posterior diameter after a good deal of traction, the difficulty being attributed chiefly to the undilated condition of the soft parts and perineum, as the peculiar nature of the pelvic contraction was not suspected. The posterior arm was then withdrawn, and the rest of the body followed without much difficulty. The perineum, however, was ruptured for about an inch, and required three sutures for its repair. During this operation an injection of strychnine and atropine was given, and after the patient had been returned to bed a coffee enema was administered. At 11 p.m. the pupils were still contracted, the face was suffused, the lips were livid, and the breathing was extremely rapid and shallow. Respiration 50-60, pulse 170, temperature 99·6°. The abdomen was flatulent and distended, but less tender, and there was no sickness. As the condition clearly indicated acute septicæmia of the worst type, 20 c.c. of antistreptococcic serum were injected into the loin.

February 15: In the early morning sickness began and continued for several hours. The pulse and respiration were still very rapid, but the temperature was only 98°. 10.30 a.m.: the bowels acted freely, but the abdomen had become more distended. Pulse 160, respiration 52, temperature 99°. A little later the pulse was uncountable, the breathing more rapid, and the abdomen very tender. Death occurred at 4 p.m., or twenty-two hours after admission, from acute septicæmia and peritonitis.

The autopsy revealed a rupture of the lower segment of the uterus extending into the vagina, and opening the peritoneum in Douglas's pouch.

The previous history of the patient was to the effect that she was

in excellent health up till the time of her confinement, that she had never been seriously ill, and that no limp, or lameness, or curvature of the spine had been noticed by her friends. She was a strong, active young woman, and a good walker.

The general characters of the dried pelvis are exhibited in the photographs (Figs. 1 and 2). There is a deficiency in the development of the right ala of the sacrum, and of the adjoining part of the right ilium, and the right sacro-iliac joint is partially ankylosed. The right iliac fossa is smaller and much less concave than the left. The epiphyses for the iliac crests are not yet united. In other respects the right os innominatum is as well developed as the left.

Sacrum.—The base of this bone shows a congenital abnormality in its formation, which is quite distinct from the ill-development of the right ala. This abnormality consists in the production of two long costal processes for the first sacral vertebra, which are quite separate from the alæ. In fact, the first sacral vertebra very closely resembles the last lumbar; it has a long, narrow spinous process; the laminæ are distinct, and not ossified to the succeeding laminæ; the superior and inferior articular processes are well formed, and the costal processes are in a line with those of the last lumbar vertebra. That it is not an additional (sixth) lumbar is proved by its ankylosis to the remainder of the sacrum, which is composed of only four vertebræ, and by the position of the first sacral foramina which run between the alæ and the above-mentioned costal processes. These foramina are very small and slit-like both in front and behind, as though compressed from above downwards. The body of the first sacral is much less deep than usual, and the position of the first intervertebral ridge is obscured by an irregular ossific deposit upon the anterior aspect of the sacrum. But the interval between the first and second centra can be recognised posteriorly, and the depth of the first vertebra behind is found to be under 2 cm.

Before leaving the first sacral costal processes, it should be noted that the right one is somewhat longer than the left, and is directed more strongly backwards in consequence of the increased traction on the right posterior sacro-iliac ligaments, many bundles of which are inserted into it. The extremity of the right costal process is in close contact with the ilium, but does not articulate with it; on the left side, owing to the greater width of the ala, the end of the costal process is some distance from the ilium.

From the foregoing description of the first sacral costal processes, it will be understood that they do not enter into the formation of the alæ, and that the promontory is therefore elevated above the

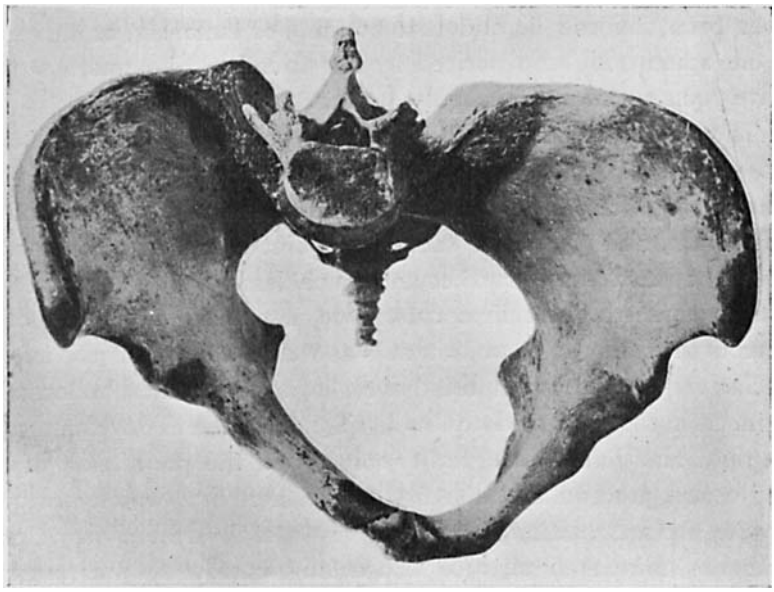

FIG. 1.—PELVIS A.

The pelvis (including the last lumbar vertebra) is viewed from above at right angles to the plane of the brim. The obliquely oval outline of the brim can be traced, and the figure-of-8 contraction of the cavity is well seen. Note the different directions of the posterior sacro-iliac ligaments as mentioned in the text.

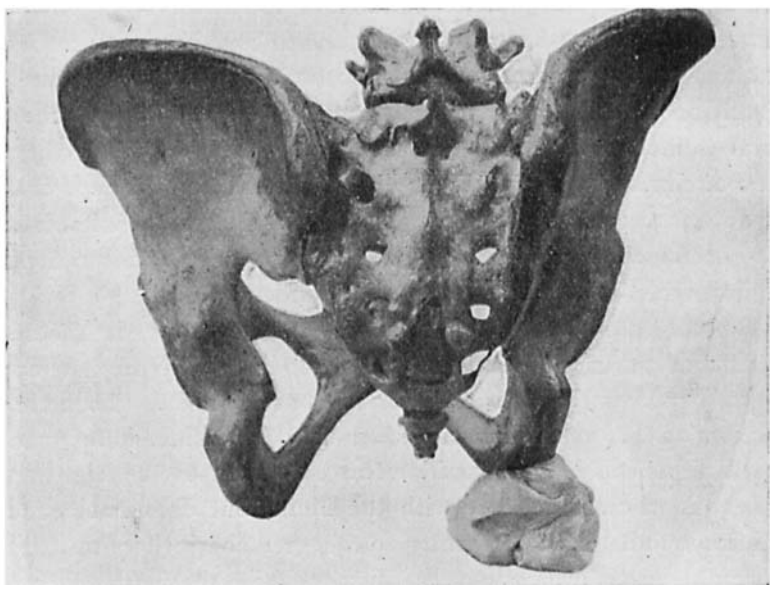

FIG. 2.—PELVIS A.

The separate spine and arch of the first sacral vertebra are seen below the last lumbar. The first posterior sacral foramina are too small to be recognised. Note the diminution in width of the right half of the sacrum.

base of the sacrum, or, more accurately, above the plane of the pelvic brim, by the depth of the first sacral vertebra, which is roughly 1·5 cm.

The alæ are formed chiefly from the costal processes of the second sacral vertebra, and the succeeding vertebræ have a normal arrangement. The right ala is considerably smaller in all directions than its fellow. From the median line of the sacrum to the sacro-iliac joint is 3 cm. on the right side, and 5 cm. on the left. Measurements of the alæ from before backwards and from above downwards also show differences in favour of the left side. There is an irregular ossific deposit on the front of the sacrum which affects the anterior surfaces of the first four bodies. It is, however, limited to the bodies, and does not extend beyond the line of the sacral foramina. This limitation is of importance, for it excludes the possibility of attributing the ankylosis of the right sacro-iliac joint to any inflammatory lesion in the articulation. The bony surfaces in the vicinity of both joints are quite smooth, and free from any indication of disease. The cause of the ossific deposit on the bodies is not obvious. The character of the new bone indicates an osteoplastic process from periosteal irritation without evidence of caries or necrosis. There is no similar change on the posterior aspect of the sacrum, nor, indeed, in any other part of the pelvis. The most striking features on the back of the sacrum are the presence of a separate and well-developed first sacral spinous process, and the diminished width of the right half of the bone. From the median line behind to the level of the sacro-iliac joints is 3 cm. on the right side, and 4·5 cm. on the left. The outlines of the inferior articular processes of the first vertebra are very distinct, but they are completely ankylosed to the superior processes of the second vertebra.

Ossa Innominata.—The right hip-bone differs from the left chiefly in the smaller size of its iliac portion and the diminished curvature of the whole bone, especially along the ilio-pectineal line. The right iliac fossa is much less concave than the left, and measures 10·5 cm. by 8·5 cm., as against 12 cm. by 9 cm. on the opposite side. The posterior extremity of the right ilium, where it enters into the sacro-iliac joint, is somewhat smaller than its fellow, but the difference is not great. In this respect the specimen now under consideration is in marked contrast with pelvis B, in which the corresponding part of the ilium is very ill-developed. The remaining parts of the right os innominatum show no deficiencies in development, and except for alterations in curvature and direction, the bones are alike on both sides.

Sacro-iliac Joints.—There is complete bony ankylosis of the right joint along its anterior inferior and posterior aspects, and though the line of the articulation can be traced without much difficulty, yet the articulating edges are so completely welded as to form a perfectly smooth surface. On the superior aspect of the right joint, along the base of the sacrum, the line of the articulation is quite distinct, and the edges of the bones, though in very close apposition, are not ankylosed. In the recent state no movement could be obtained between the ilium and sacrum on the right side. On tracing the outline of the right joint, it will be seen that the ala exhibits above a very pronounced 'bite' or triangular projection, which is firmly wedged into a corresponding depression in the ilium. The situation of this 'bite' probably marks the ridge between the articular and non-articular surfaces of the right ala, but it is impossible to make sure of this without damaging the specimen. The lower limit of the right joint is nearly on a level with the left, but owing to the atrophy of the right posterior inferior iliac spine, and the increase in height of the great sacro-sciatic notch, the area of the right articulation seems much smaller than it is in reality. The circumferences of the two joints, when carefully traced with a tape measure, showed a difference of little more than one centimetre in favour of the left side. At the back of the right joint it will be noticed that the fibres of the posterior sacro-iliac ligament run almost directly backwards and a little upwards, while on the opposite side they run outwards and backwards. If the lines of these bands be prolonged forwards, they will meet in front of the sacrum, almost at a right angle. More striking still is the altered relation of these ligaments to the sacro-cotyloid beam, or that thickened portion of the os innominatum which extends from the synchondrosis to the summit of the acetabulum. On the right side the angle formed between a line through the posterior sacro-iliac ligaments and the long axis of the adjacent sacro-cotyloid beam is 30°; on the opposite it measures 75·5°. The mechanical advantage thus gained on the left side goes far to explain the greatly increased curvature of the left side of the pelvic brim, and its diminution or flattening on the ankylosed side. Moreover, the right ala has sunk somewhat forwards into the pelvis, so that there is a backward projection of the right ilium behind the limit of the synchondrosis, amounting to at least 1 cm. in excess of that on the opposite side.

The condition of the sacro-sciatic notches will next engage attention. The right notch differs from the left in width and in the level of its summit, but the actual depth of the notch is the same on

both sides. The width of the right notch is 4·5 cm., and of the left 6 cm.; while the summit of the right notch is about 1 cm. higher than the left — a difference which corresponds very closely with the increased backward and upward displacement of the right hip-bone, as described above. But not only is the right notch narrower than its fellow: there is also a marked inward displacement of the right ischium and its spine, whereby the sharp anterior edge of the right notch is carried inside the plane of the right margin of the sacrum. The corresponding edge of the left notch is in consequence thrust outwards, and if the distance of this edge from the median plane of the sacrum be taken, it will be found that this distance measures only 3 cm. on the right side, and 6·5 cm. on the left. This inward thrust of the ischium and its spine on the ankylosed side is of very great importance, because it leads to a peculiar figure-of-8 contraction of the plane of the pelvic cavity at that level which practically corresponds with the plane of the outlet.

The measurements of this pelvis are as follows:

	Cm.
1. Anterior interspinous diameter	22·5
2. Intercristal	24·5
3. External conjugate	18·0
4. True conjugate	9·5
5. Diagonal conjugate	11·0
6. Posterior interspinous	6·5
7. From right A.S.S. to left P.S.S.	19·0
From left A.S.S. to right P.S.S.	21·5
8. From right P.S.S. to left tuber ischii	18·0
From left P.S.S. to right tuber ischii	14·0
9. From right A.S.S. to 5th lumbar spine	15·5
From left A.S.S. to 5th lumbar spine	17·5
10. From right P.S.S. to lower border of symphysis ...	18·0
From left P.S.S. to lower border of symphysis ...	16·0
11. From right P.S.S to posterior median line of sacrum	3·0
From left P.S.S. to posterior median line of sacrum	3·5
12. From right ischiatic spine to edge of sacrum (nearest point)	4·0
From left ischiatic spine to edge of sacrum (nearest point)	6·0
13. From right tuber ischii to tip of sacrum	8·0
From left tuber ischii to tip of sacrum	10·0

	Cm
14. From centre of sacral promontory to right ilio-pectineal eminence	6·5
From centre of sacral promontory to left ilio-pectineal eminence	10·5
15. From promontory to right (ankylosed) sacro-iliac joint	3·5
From promontory to left sacro-iliac joint	5·0
16. The antero-posterior diameter of the sacral promontory passes through the right body of the pubes 2·5 cm. to the right of the symphysis	
17. Transverse diameter of pelvic brim	11·5
18. Right oblique diameter of brim	12·5
Left oblique diameter of brim	9·5
19. Antero-posterior diameter of outlet	11·5
Transverse diameter of outlet	9·5
Between spines of ischia	8·0
20. From lower edge of symphysis to right ischial spine	9·0
From lower edge of symphysis to left ischial spine	7·5

Pelvis B.

The general characters of this pelvis are well shown in the accompanying photographs (Figs. 3 and 4). There is complete osseous ankylosis of the right sacro-iliac articulation, and marked deficiency in the development of the right ala of the sacrum and the right ilium. There is no evidence of arrested growth in any part of the ischium, pubes or acetabulum, and except for such changes as result from alterations in the lines of pressure there is nothing abnormal in these parts.

The Sacrum.—The right ala of the sacrum is much smaller than the left, and its width is especially deficient. From the centre of the promontory to the sacro-iliac joint is 4 cm. on the right side, and 6·5 on the left. The direction of the right ala is also much more horizontally outwards than the left. The first right anterior and posterior sacral foramina are somewhat smaller than those on the opposite side, but the remaining foramina in front and behind are not affected. Though the right sacro-iliac joint is completely ankylosed, the line of the articulation is clearly indicated by a bony ridge, which shows that the costal processes of the first two sacral vertebræ have entered into the formation of the right joint, while on the

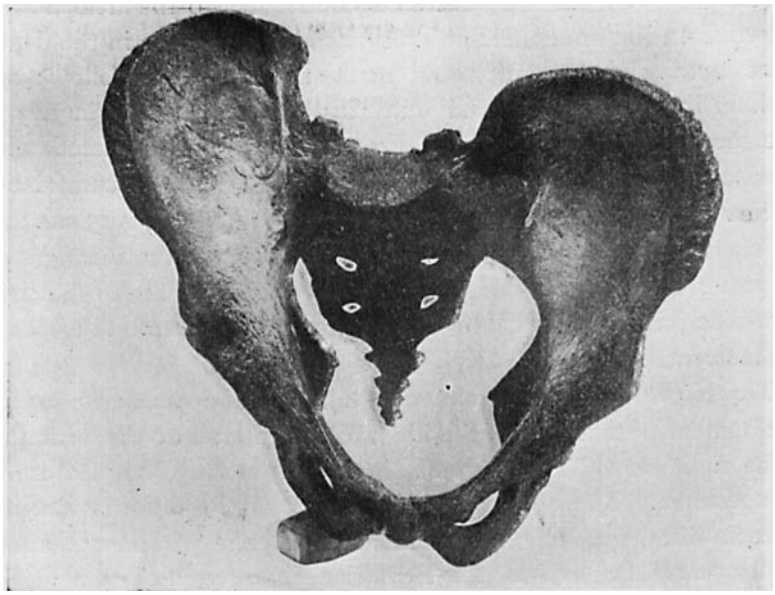

FIG. 3.—PELVIS B.

The inversion of the right ischial spine and the narrowness of the right sacro-sciatic notch are easily recognised. Note the difference in shape and elevation of the right ilium, and the flattening of the ilio-pectineal line on that side. The epiphyses for the iliac crests have become detached.

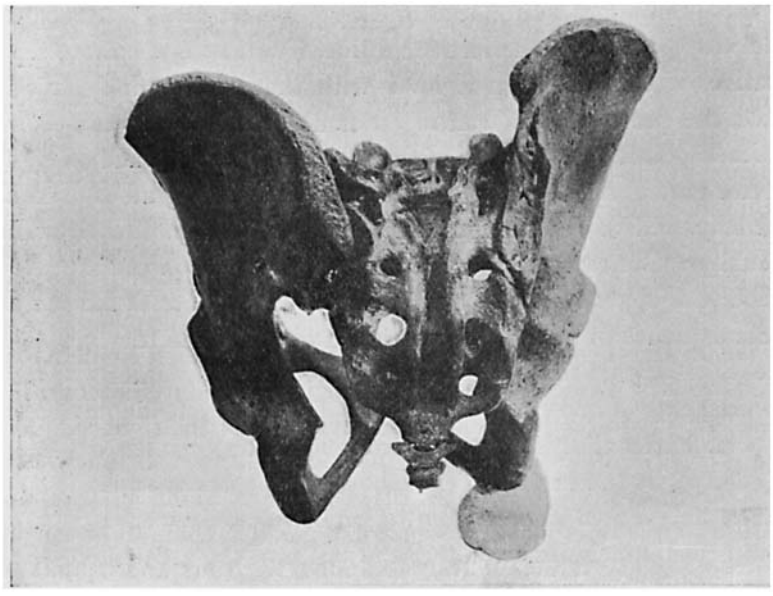

FIG. 4.—PELVIS B.

Note the absence of the tuberosity of the ilium. The prominent end of the crest is not the posterior superior spine; its site is just above the level of the second sacral foramina. The straightness and upward displacement of the right ilium are well shown.

left side a part of the third vertebra contributes to the articulation. Viewed from the front there is a very striking difference in the depth of the sacral alæ, the right being much smaller than its fellow; but on closer inspection it is seen that this difference is due largely to deficiency in the development of the right ilium associated with increased depth of the right sacro-sciatic notch. The circumference of the right ala passing through the summit of the notch is 15 cm.; on the left side it measures 19 cm. There are no important changes on the posterior aspect of the sacrum except such as relate to the right sacro-iliac joint, which will be described with the ilium. The coccyx also is normal.

The Right Ilium.—As already stated, the deficiencies in the development of that part of the ilium which enters into the formation of the right sacro-iliac joint constitute the most striking feature in the specimen. The epiphysis for the crest of the ilium is wanting on both sides, which probably indicates that the patient was about twenty years of age. On the right side, that rough portion of the iliac crest which constitutes the tuberosity of the ilium is wanting, and the posterior extremity of the crest ends prominently about ¾ inch above the level of the sacro-iliac joint. Hence there is a considerable difference in the lengths of the two iliac crests: the left crest is 24 cm. in length, while the right one only measures 16 cm. But this prominent termination of the right crest cannot be regarded as the true posterior superior iliac spine, for there is a minute representative of this spine on a level with that of the opposite side. Hence the piece that is wanting includes the greater part of that thickened posterior extremity of the ilium which is marked off by the superior gluteal ridge, and gives attachments to the gluteus maximus externally, and to the posterior sacro-iliac and ilio-lumbar ligaments internally. Both posterior inferior iliac spines are on the same level —about the upper border of the third costal processes of the sacrum. In consequence of the above-mentioned deficiency in the right bone, there is a very marked difference in the width or antero-posterior measurements of the two iliac bones. Thus, the left ilium measures 14·5 cm. horizontally backwards from its anterior inferior spine to the edge of its tuberosity a little above the posterior superior spine, while a line drawn similarly on the right side only measures 11 cm. There is also much diminution in the width of the great sacro-sciatic notch on the right side as compared with the left. Thus, the greatest width of the latter is 5 cm., but the right notch is only 3·5 cm., and would probably be less but for the inward displacement of the right ischiatic spine, which has carried the anterior edge of the notch with

it. The degree of this inward displacement of the spine of the right ischium and anterior edge of the great sacro-sciatic notch is very considerable, but can hardly be expressed in figures. From the anterior median line of the sacrum opposite the centre of the third body horizontally outwards to the anterior edge of each notch measures 4 cm. on the right side and 8 cm. on the left. When viewed from the front, the tip of the right ischiatic spine is in the same plane as the row of right sacral foramina, while the left ischiatic spine is at least 3 cm. outside the plane of the left sacral foramina. The first sacral foramina both in front and behind on the right side are somewhat smaller than their fellows, but there are no differences in the succeeding foramina from those of the opposite side. The apex of the great sacro-sciatic notch on the right side is on a level with the middle of the body of the second sacral vertebra, but on the left side it is fully 2 cm. lower—in fact, not much above the middle of the third body. In spite of this difference in level, the actual length of the great sacro-sciatic notch, as measured from its apex to the tip of the ischiatic spine, is practically the same on both sides. Hence the elevation of the right notch corresponds with the upward displacement of the whole right os innominatum, and may be taken as the index of that upward displacement. Hence, as both os innominata are of the same length, the right iliac crest is 2 cm. higher than the left, and the same holds good for the levels of the tuber ischii of each side.

On looking at the pelvis as a whole, the altered shape of the pelvic brim is well seen. The superior edge of the sacrum or promontory is very high, being fully 2 cm. above the plane of the brim. Tracing the pelvic brim round from the front of the first sacral vertebra, the line passes first horizontally outwards to the right. Immediately beyond the first sacral foramen the line turns sharply forwards, almost at right angles to the anterior surface of the sacrum, and is continued on to the symphysis pubis as the ilio-pectineal line. From the ridge which marks the ankylosed sacro-iliac joint to a point corresponding with the right ilio-pectineal eminence this line runs very nearly straight forwards, but beyond this point it has a slight gentle curve up to the symphysis. On tracing the left side of the pelvic brim, we note that the line makes a very large curve from the front of the sacrum along its left ala and the left ilio-pectineal line as far as the corresponding ilio-pectineal eminence; thence onwards to the symphysis pubis the curvature of the outline is much diminished. If the plane of the pelvic brim be divided into two chords by a line from the centre of the promontory to the symphysis

pubis, the height of the right chord (ankylosed side) is 4·5 cm., but that of the left chord is 7 cm. The convexity of the right chord is 16 cm., and of the left 20 cm.

Besides the obliquity of the pelvic brim, the backward displacement of the right ilium must be noted. This may be expressed in figures by marking the levels of the anterior inferior iliac spines upon the antero-posterior diameter of the pelvic brim. A line drawn from the front of the right spine at right angles to this diameter is found to be 4 cm. behind the line similarly drawn on the left side. The whole of the right os innominatum is displaced backwards and upwards in relation to the opposite bone, its iliac fossa is smaller and less concave, and the long axis of the bone from the highest part of the crest to the tuber ischii is straighter than its fellow. Passing through the pelvic cavity to the outlet, there is a progressive diminution in width which renders the cavity funnel-shaped, as well as a very marked inversion of the right ischium, and especially of its spine, whereby the cavity near the plane of the outlet is greatly constricted. The interval between the tips of the ischial spines is only 6·5 cm., and the inward projection of these spines is such that the sacrum is quite outside the circle formed by the plane of the pelvic cavity at that level. The diameter of this circle is about 8 cm., or just over 3 inches, and this represents the available space for the passage of the fœtal head.

This approximation of the ischial spines is of the greatest importance from an obstetric point of view, and although it may not be measurable clinically, yet in high degrees of deformity, as in this pelvis, the inversion of these ischial spines would be easily recognised on vaginal or rectal examination.

The following are measurements of the pelvis as a whole:

	Cm.
1. Interspinous diameter	21·5 ($8\frac{1}{2}$ in.).
2. Intercristal diameter	24·0 ($9\frac{1}{2}$ „)
3. External conjugate diameter	16·5 ($6\frac{1}{2}$ „)
4. True conjugate diameter	11·5 ($4\frac{1}{2}$ „)
5. Diagonal conjugate diameter	13·0 ($5\frac{1}{8}$ „)
6. From right A.S.S. to left P.S.S.	19·0
From left A.S.S. to right P.S.S. ...	19·0

Owing to the deficiency at the back of the right ilium, the termination of this diameter on the right side cannot be accurately fixed; hence this measurement loses much of its value.

Cm.

7. From right A.I.S. to middle of sacral promontory ... ...= 9·0
   From left A.I.S. to middle of sacral promontory ... ...=12·5
8. From right P.S.S. to left tuber ischii ...=16·0
   From left P.S.S. to right tuber ischii ...=14·0
9. From right P.S.S. to posterior median line of sacrum ... ...= 2·5
   From left P.S.S. to posterior median line of sacrum ... ...= 4·5
10. From right ischiatic spine to edge of sacrum (nearest point) ... ...= 2·5
    From left ischiatic spine to edge of sacrum (nearest point) ... ...= 4·0
11. From right tuber ischii to tip of sacrum...= 7·0
    From left tuber ischii to tip of sacrum ...= 9·0
12. From centre of sacral promontory to right ilio-pectineal eminence ... ...= 7·5
    From centre of sacral promontory to left ilio-pectineal eminence ... ...=11·0
13. From centre of sacral promontory to right (ankylosed) sacro-iliac joint ... ...= 4·0
    From centre of sacral promontory to left sacro-iliac joint ... ...= 6·5
14. The antero-posterior diameter of the sacral promontory passes through the right body of the pubes 2·5 cm. to right of the symphysis.
15. The right sacro-cotyloid diameter ...= 8·0
    The left sacro-cotyloid diameter ...=11·0
16. Right oblique diameter of brim ... ...=12·5
    Left oblique diameter of brim ... ...=10·5
17. The transverse diameter of brim ... ...=11·0
18. The antero-posterior diameter of outlet ...=11·0
    The transverse diameter of outlet ...= 8·0
    Between the spines of the ischia ... ...= 6·5
19. From the lower edge of the symphysis to both ischiatic spines and to both posterior-superior iliac spines are practically the same on the two sides, the difference in favour of the right side not exceeding ¼ inch.