left salpingo-oophorectomy and a partial right salpingectomy were carried out. Following this operation the lower end of the wound discharged blood at regular cycles accompanied by a recognizable increase in the size of the uterus and considerable pain. The diagnosis of hæmatometra and utero-abdominal fistula was made and on further laparotomy this was seen to be due to the right tube being adherent to the previous wound. Subtotal hysterectomy and right salpingectomy resulted in a cure of the symptoms.

This case affords a further argument against salpingectomy for acute salpingitis discovered inadvertently after laparotomy for suspected appendicitis.

Reference.—DRIPS, D. G. (1928–29), *Med. Clin. of N. America*, **12**, 1579.

Mr. G. B. THOMAS : I operated upon such a case last March. The woman had had a ventro-suspension of the uterus performed a few years ago, shortly after which a small sinus had appeared in the lower part of the scar. It was very small and would barely admit the point of a fine needle, but a little blood escaped from it at the menstrual periods.

It was dealt with by opening the abdomen in the mid-line by an incision which surrounded the fistulous opening, which, together with the fistulous track, was thus left attached to the apex of the uterus. It was then removed by excision of a wedge from the fundus of the uterus, and the latter was then sutured. The abdomen was otherwise normal.

No silk or other non-absorbable material was detected in the excised tissue. Apparently at the ventro-suspension operation the needle had been passed too deeply and had entered the uterine cavity.

Pelvic Osteo-arthropathy of Pregnancy

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ABSTRACT.—Excessive relaxation of the pelvic joints during pregnancy has as its chief symptoms chronic backache and locomotor disturbances. Goldthwait and others have for long drawn attention to the frequent part played by softening of the sacro-iliac joint structures in the production of the common backache of pregnancy. The frequency of this symptom may be gauged by the fact that 114 women out of a successive series of 3,030 cases at the antenatal clinic, or 3·7%, suffered in such a degree as to lead them to call for treatment. In 69, or 60·5%, the pain commenced before the 28th week, whilst in the remaining 45 or 39·5%, it commenced later.

Clinical states due to joint relaxation during pregnancy (excluding coccygeal lesions) may be divided into two main groups :—

(1) Here the sacro-iliac joints are alone affected. There is no obvious lesion in the pubes and the pelvis rotates as a whole at the sacro-iliac joints. This is probably a common, possibly the chief, cause of pregnancy backache, but owing to the difficulties incidental to the diagnosis of backache with no obvious pathology, it is impossible to establish its relative incidence with any accuracy.

(2) Here the pubic joint is also affected with, as a result, a rocking of the two sides of the pelvis on the sacro-iliac joints. Here the pubic pain, the perceptible mobility of the symphysis, and X-ray examination, all help to establish a diagnosis and an estimate of incidence.

The present communication is based upon an examination of 42 such cases. 34 occurred in a successive series of 4,512 pregnant women, that is 0·75%.

These cases exhibit the same basic clinical features, namely pain and tenderness in the sacro-iliac and pubic regions coming on usually during pregnancy and aggravated by walking. Walking is often difficult, in severe cases impossible, and there is frequently a waddling gait, the characters of which are shown in the moving picture of 5 cases.

The ætiology and treatment are discussed.

RÉSUMÉ.—Les symptomes principaux du relâchement excessif des articulations pelviennes pendant la grossesse sont des douleurs lombaires chroniques et des troubles de la démarche. Goldthwait entre autres a depuis longtemps attiré l'attention sur le rôle fréquent du ramollissement des structures articulaires sacro-iliaques dans la production des douleurs lombaires fréquentes de la grossesse. La fréquence de ce symptome peut être estimée par le fait que dans une série de 3,030 cas consécutifs observés à la clinique anté-natale 114, ou 3·7% souffraient suffisament pour réclamer un traitement. Chez 69, ou 60·5%, les douleurs ont commencé avant la 28e semaine, tandis que chez les 45 autres, ou 39·5%, elles ont commencé plus tard.

Les états cliniques dus au relâchement des articulations pendant la grossesse (sans compter les lésions coccygéales) peuvent être divisées en deux groupes principaux :

(1) Les articulations sacro-iliaques seules sont affectées. Il n'y a pas de lésion évidente au pubis et le bassin tourne en une pièce sur les articulations sacro-iliaques. Ceci est probablement une cause fréquente, peut-être la cause principale, des douleurs lombaires pendant la grossesse, mais comme il est difficile de diagnostiquer les douleurs lombaires dans l'absence de pathologie évidente, il est impossible d'en établir la fréquence relative avec exactitude.

(2) La symphyse est aussi affectée. Par conséquent les deux côtés du bassin se balancent sur les articulations sacro-iliaques. Dans ce cas les douleurs pubiques, la mobilité perceptible de la symphyse et l'examen radiologique aident à établir le diagnostic et à estimer l'incidence des cas.

Cet ouvrage est basé sur l'examen de 42 cas de cette espèce. 34 ont été trouvés dans une série consécutive de 4,512 femmes gravides, ce qui donne une fréquence de 0·75%.

Tous ces cas avaient les mêmes symptomes cliniques fondamentaux, c'est-à-dire des douleurs et de la sensibilité dans les régions sacro-iliaque et pubique, commençant généralement pendant la grossesse, et aggravées par la marche. La marche est souvent difficile, quelquefois impossible, et la démarche est souvent dandinante. Les caractères de la démarche sont démontrés par un film illustrant 5 cas.

Discussion de l'étiologie et du traitement.

ZUSAMMENFASSUNG.—Goldthwait und andere haben schon seit langem darauf hingewiesen, wie häufig die Erweichung der Sakroilialgelenke bei der Entstehung der so häufigen Rückenschmerzen bei der Schwangerschaft eine erhebliche Rolle spielt. Wie häufig dieses Symptom ist geht aus der Tatsache hervor, dass von 3,030 auf der pränatalen Klinik beobachteten Fällen bei nicht weniger als 114 (3·7%) die Beschwerden so stark waren, dass Behandlung notwendig wurde. Bei 69 (60·5%) begannen die Schmerzen vor der 28 Woche, bei den restlichen 45 (39·5%) zu einem späteren Zeitpunkt.

Die durch die während der Schwangerschaft eintretende Gelenkerweichung verursachten klinischen Zustände (abgesehen von coccygealen Läsionen) kann man in zwei Hauptgruppen einteilen :—

(1) Die Veränderungen betreffen auschliesslich die Sakroilialgelenke. Es bestehen keine nachweisbaren Veränderungen an den Schambeinen und das Becken rotiert als Ganzes um die Sakroilialgelenke. Dieser Zustand ist wahrscheinlich eine häufige, möglicherweise die hauptsächliche Ursache der Schwangerschaftrückenschmerzen; da aber mangels einer nachweisbaren pathologischen Veränderung die Diagnose schwierig ist, ist es unmöglich irgendwelche genaueren Angaben über die relative Häufigkeit zu machen.

(2) Die Symphyse ist mitbetroffen; dementsprechend führen die beiden Seiten des Beckens eine Schaukelbewegung um die Sakroilialgelenke aus. In diesen Fällen ermöglicht der in der Gegend der Schambeine lokalisierte Schmerz, die nachweisbare Beweglichkeit der Symphyse und die Röntgenuntersuchung die Diagnose zu stellen und ein Urteil über die Häufigkeit des Zustandes zu gewinnen.

Der vorliegenden Mitteilung liegen die Befunde bei 42 solcher Fälle zugrunde. 34 wurden in einer lückenlosen Serie von 4,512 Schwangeren beobachtet, d.h. in 0·75%.

Alle diese Fälle zeigen grundsätzlich die gleichen klinischen Erscheinungen, nämlich Schmerzen und Druckempfindlichkeit in der Gegend der Sakroilialgelenke und der Pubes, die gewöhnlich während der Schwangerschaft auftreten und durch Gehen verschlimmert werden. Das Gehen ist oft erschwert, in schweren Fällen sogar unmöglich, und häufig besteht ein watschelnder Gang, dessen Charakteristika in einem Film (Beobachtung an 5 Fällen) illustriert werden.

Die Aetiologie und Behandlung werden besprochen.

FROM ancient times it has been known that during pregnancy there occurs a softening of the structures of the pelvic joints and that this results in the acquisition by these joints of a degree of movement which they do not ordinarily possess. Within recent years these changes have been studied by means of X-rays. Heyman and Lundqvist (1932) as a result of the examination of 74 pregnant women and eight women during labour, concluded that pregnancy is invariably accompanied by an increase in the width of the symphysis pubis. This increase, which averages 2 mm., varies between 1 mm. and 12 mm. in different women. It commences in the early months and probably reaches its maximum two or three months before labour. There is no increase during labour and within several weeks after labour the pubic joint has returned to its previous state. Roberts (1934) at a meeting of this Section in 1934 reported similar findings and he showed also that there occurs a slight measurable widening of the sacro-iliac joints which again disappears soon after parturition. Abramson, Roberts and Wilson (1934) and others have published similar results and in their paper they allude to the clinical states which may arise from excessive relaxation of the pelvic joints during pregnancy.

From time to time in the literature records have appeared of excessive separation of the pelvic joints, more especially of subluxation of the symphysis pubis. I am probably correct in stating that to most obstetricians the subject has been more of academic than of practical interest unless they have seen a case exemplifying the somewhat rare major degrees of damage.

My first contact with the condition was a woman whom I confined about twenty years ago. Immediately after the delivery she complained of severe pain and tenderness at the pubic joint. Despite complete rest in bed the condition persisted and movement was so painful that she was unable to get out of bed at the end of fourteen days. As it was imperative for her to sail to South Africa without delay she had to travel to the ship by ambulance. The next case of which I have records, occurred some twelve years later. Mrs. A., aged 27, was first seen two months after her first birth. Since the birth she had difficulty in walking, with pain round the pelvic girdle and marked tenderness at the region of the pubes and both sacro-iliac joints. There was a marked waddle in the gait and pain and tenderness located over the adductor muscles of the thigh on each side. X-ray examination revealed a wide separation at the symphysis pubis. Rest in bed with firm strapping of the pelvis led to a quick subsidence of the pain and tenderness and recovery of the locomotor functions. A year later this patient became pregnant again, and, at the fourth month, the symptoms, pain over the pubes and limping gait, recurred. On this occasion there was also severe pain in the back with tenderness over both sacro-iliac joints. By the thirty-second week the symptoms were so grave that the patient was unable to stand or walk. Despite complete rest in bed, dietetic measures and support of the pelvis by means of strapping, the pain persisted, and any movement, such as that required in the use of the bedpan produced severe pain in the pubic and sacro-iliac regions. Having regard to the experience following the previous birth Cæsarean section followed by sterilization was carried out on October 2, 1932. Thereafter, by the use of the appropriate measures, rest, massage, immobilization of the pelvis with strapping and a firm surgical belt, a satisfactory recovery was established within three months. In parenthesis I would state that, with greater experience we find that, even in such aggravated cases, Cæsarean section is not necessary. With adequate care during the pre-natal and post-natal periods good recovery can generally be expected even after pelvic delivery.

The next case was even more striking in its clinical features. Mrs. H., aged 30, had her first birth in 1928. The delivery was normal and spontaneous and the child, 8½ lb. in weight, was alive and well. In 1932, at the end of the sixth month of the second pregnancy, in getting out of her car she felt that something was wrenched and she was seized with sudden pain in the lower abdomen. She had difficulty in walking the few steps to her house and thereafter she remained for five days in bed.

On getting up she experienced difficulty in walking and felt pain on the outer side of the right thigh and in the lower abdomen. When seen three weeks later she was unable to stand without severe pain in the pelvis and walking was associated with a waddling gait. There was marked tenderness over the symphysis pubis. X-ray examination showed the pubic bones to be unduly separated and this was associated and probably determined by a tearing loose of the surface of bone underlying the right aspect of the joint. When standing alternately first on one foot and then on the other there was found to be an upward gliding movement of the corresponding side of the pelvis. This case exemplifies a finding which I have seen repeated in a number of subsequent cases, the dating of the symptoms from a comparatively trivial trauma, such as a strain or fall, suggesting that the weakening of the joint structures exposes them to easy damage. Another point which is raised by this case is that the weakening process may affect the bony tissue and that we are not necessarily dealing merely with a change in the softer joint elements.

Since having the cases just described I have seen several further examples of severe pubic and sacro-iliac damage in relation to pregnancy. But I wish now to draw attention to the fact that these somewhat dramatic instances of this lesion constitute merely the rarer manifestations of a state which is by no means uncommon in a milder and easily neglected form.

The clinical states which owe their origin to joint relaxation during pregnancy (excluding coccygeal lesions) may be divided into two main groups :—

(1) Here the symptoms are restricted to the sacro-iliac region. There is no clinical evidence of a pubic lesion and the pelvis remains compact, the pain and locomotor disturbance being explained by an excessive rotation of the whole pelvis at the sacro-iliac joints. This is a common, possibly the chief, cause of the frequent pregnancy backache as Goldthwait (1907) and others have contended. Dr. Hannah Elder at the Ante-natal Clinic of the Edinburgh Royal Maternity and Simpson Memorial Hospital found 114 women out of a successive series of 3,030 cases, or 3·7%, who suffered in such a severe degree during their pregnancy as to lead them to call for treatment. At the same time, the diagnosis in this class of backache, which ordinarily possesses no pathology that can be recognized by X-rays or other means, being notoriously difficult, it is impossible to establish with accuracy the relative incidence of the above factors.

(2) In the second group the relaxation of the pubic joint is associated with localizing symptoms. Here the change results in a loosening of the two sides of the pelvis, which rock separately at the corresponding sacro-iliac joint. Pubic pain and tenderness, perceptible mobility of the symphysis and X-ray examination all help to establish a diagnosis and thus a reliable estimate of incidence.

The present communication is based upon an examination of 42 such cases 34 occurred in a successive series of 4,512 pregnant women, that is 0·75%. This may be taken to represent the minimal incidence of the combined pubic and sacro-iliac lesion for it is found that the more carefully cases of pregnancy backache are studied the more frequently does one find an associated pubic picture. Naturally it is the milder cases which are liable to be overlooked.

Pubo-sacro-iliac Osteo-arthropathy

Clinical features.—These cases exhibit the same basic clinical features, namely, pain and tenderness in the sacro-iliac and pubic regions coming on usually during pregnancy and aggravated by walking. Walking is often difficult, and, in severe cases, impossible and there is frequently a limp or waddle in the gait. (The characters of this gait were exemplified by a moving picture of five cases exhibited by Professor Young.) In some cases the pain and tenderness are located to one, in others to both, sacro-iliac joints. In cases exhibiting severe locomotor difficulty there is often pain

and tenderness along the line of the adductor muscles of the thigh, which probably arise from stretching of these muscles as during walking the side of the pelvis containing their attachment is displaced forcibly upwards. In a considerable number of cases the patient dates the symptoms abruptly to some trauma, which may be trivial, such as a slip or fall. In one instance the bending down to tie a shoe-lace was immediately followed by acute symptoms. This point I shall raise again.

In 34 cases there are records of the time of first onset of symptoms. In one case these first appeared ten days post-partum after the patient had got out of bed. In the remaining 30 the condition arose during pregnancy. The average date of onset was the twenty-fourth week of pregnancy, the earliest date being eight weeks, the latest thirty-six weeks. 14 cases were primigravidæ—in these the average date of onset was 25·7 weeks. 14 were paræ and in these the average date of onset was 22·8 weeks.

Changes in the joints and a consideration of ætiology.—No attempt was made in this investigation to carry out an exact measure of the width of the joints but we have been impressed by the fact that the severity of the symptoms does not bear, as other workers have suggested, any correlation with the increase in pubic separation. On this matter our evidence is convincing in that many cases with severe symptoms

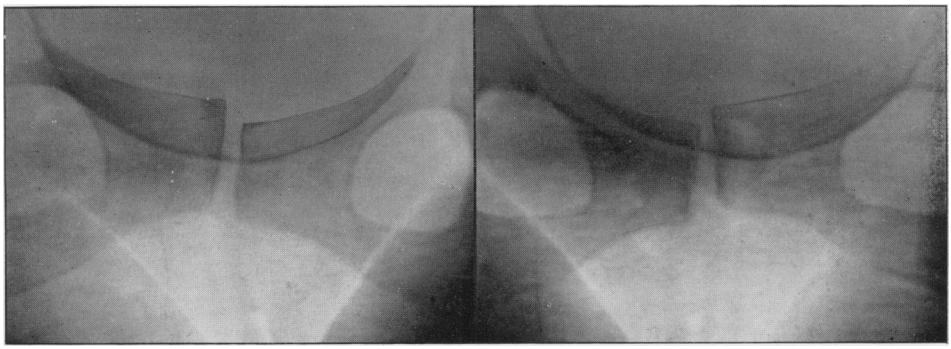

FIG. 1.—Gliding movement at symphysis pubis. Patient standing on right leg. Pregnancy thirty-nine weeks.

FIG. 2.—Same patient standing on left leg.

exhibit no greater widening than is found ordinarily in pregnant women with no symptoms related to the pelvic girdle. At the same time where pubic symptoms are severe one can usually easily detect a gliding movement at the joint when the joint is grasped between one finger in the vagina and the thumb over the symphysis and the patient is requested to stand first on one foot and then on the other. Further in such cases there is radiographic evidence of such movement at the joint (figs. 1 and 2). We may assume, therefore, that the degree of softening and mobilization of the joints is not necessarily exhibited in the extent of the widening. From time to time, however, we do find a considerable widening of the pubic joint, but here again the gravity of the symptoms is not necessarily proportional to the degree of this widening.

The major consideration in ætiology is why a condition which must be regarded as essentially physiological should in a certain number of women pass over into the morbid. The role of trauma has been mentioned. In 5 out of 34 there was a definite causal relationship between an accident, usually minor in nature, and the onset of the symptoms.

It would seem to be clear that the tone of the muscles supporting the joints must sometimes play a part and that where this tone is lowered damage of relaxed joints must be more liable to occur. It may be significant in this connexion that 15 out of

the 34 women, or 44·1%, suffered from such associated conditions as toxæmia and pyelitis. The altered posture adopted during pregnancy may also play some part. The gradual enlargement of the womb and the passing forward of the centre of gravity results in the woman throwing the shoulders farther and farther back in order to readjust the body balance during standing and walking. This alteration in the spinal curves with a consequent transmission of the body-weight along new lines has been adduced as a cause of lumbosacral backache by creating stresses and strains in the corresponding joints and muscles. Finally, as it is now generally assumed that the relaxation of the pelvic joints during pregnancy has an endocrinal origin, the essential ætiology may eventually be found in some aberration of this function.

Treatment.—In mild cases the provision of a strong abdomino-pelvic belt and restricted exercise are sufficient to carry the patient through to delivery. In worst cases rest in bed for a period varying in different cases from one to three weeks, may so relieve the symptoms as to make walking comfortable with the support of a belt. In the worst type of case complete rest in bed till delivery is called for. In such the hammock as used for the treatment of fractured pelvis is of great value. In these women the gentlest movement in bed is not tolerated, e.g. the placing of a bedpan.

After delivery the extent to which special treatment is required varies with the case. In mild cases the symptoms have disappeared by the end of the ordinary lying-in period. In severer cases a longer rest in bed, it may be for as long as two or three weeks, is necessary and then a strong supporting belt should be worn for several months. In the worst type the hammock régime should be continued for at least a month after delivery. In some cases immobilization may be necessary for several months.

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Discussion.—Mr. C. J. K. HAMILTON: I would like to ask Professor Young if he considers that the tilting of the pelvis is a permanent or temporary matter. Recently we have X-rayed the pelves of patients who have been X-rayed previously during pregnancy and we have found that the tilt of the pelvic brim remains the same, even some time after delivery.

Recently I have seen several X-ray pictures showing a thin black line in the middle of the symphysis. Dr. Rubin tells me that he considers that this must be due to air or a vacuum. He has also noticed the same appearance in some traumatic lesions of the knee and shoulder joints. The appearance in the symphysis disappears soon after delivery.

Mr. R. NICHOL said that the question as to how much this relaxation of the pelvic joints was due to an endocrine influence, and how much to some calcium deficiency was of interest.

He thought that a glance at comparative anatomy might shed some light on this question and referred to the relaxation of the pelvic joints of the seal during pregnancy; he said that it was known that at parturition in this animal the symphysis pubis separated for several inches. Also it was known that the guinea-pig's pelvis is so small that delivery would be impossible but for a wide separation at the symphysis pubis during labour. If nature provided for such a degree of movement in these animals in their normal state, it did not seem to him that calcium deficiency was a necessary component of the mechanism.

Mr. Nichol then referred to Professor Young's mention of the part played by trauma in the ætiology of the condition which he had called pelvic osteo-arthropathy. Some years ago, when called out to assist a midwife, he had applied forceps to a fœtal head which had been arrested in its passage through a rather small pelvis. On applying moderately strong axis traction he suddenly heard a crack and the fœtal head thereupon easily came down and was delivered. On examining the pubic synchondrosis he found a space which allowed his finger to drop in, and later an X-ray showed a wide separation of the bones. Fortunately there had been no

damage to the soft parts, and after a prolonged rest with the pelvis tightly strapped the patient made a good recovery.

Professor YOUNG (in reply) stated that he had not had the opportunity of studying the question raised by Mr. Hamilton in an adequate series. In individual cases with marked rocking of the two sides of the pelvis during pregnancy he had, however, found a slight degree still present at the end of two or three weeks after labour.

The Effect of the Inclination of the Pelvic Brim and the Shape and Inclination of the Upper Sacrum on the Passage of the Head through the Upper Pelvis

By PERCY MALPAS, Ch.M., F.R.C.S., F.R.C.O.G., and C. J. K. HAMILTON, M.A., F.R.C.S.E., M.R.C.O.G.

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ABSTRACT.—Engagement of the head does not depend only on the size and shape of the brim, but also on the angle of inclination of the brim. The methods of determining this inclination are considered and the angle between the plane of the brim and the front of the body of the 5th lumbar vertebra is found to furnish the best index of the inclination. Analysis of a series of cases shows that this angle varies considerably. Its postural range is demonstrated.

When the inclination is high the head does not easily engage although the measurements may be normal, and a high inclination is one of the commonest causes of unexpected dystocia.

Because these cases are usually selected for a "trial of labour", criteria are necessary to select the cases suitable. Success or failure of trial labour in these cases depends on the amount of room in the upper pelvis. Apart from the actual size of the true conjugate the amount of room is shown to depend both on the sacral inclination, a method of measuring which is described, and the shape of the upper sacrum, which shows considerable variation. A common type of pelvis causing dystocia is one in which the inclination of the brim is high and the upper sacrum is relatively vertical and convex. Pelves of this type do not always fit into any of the standard classifications.

The uses and limitations of postural treatment of these cases are discussed.

RÉSUMÉ.—L'engagement de la tête dépend non seulement de la grandeur et de la forme de la marge du bassin, mais aussi de son inclinaison. Après avoir considéré les méthodes pour déterminer cette inclinaison, les auteurs concluent que le meilleur index est donné par l'angle entre le bord antérieur de la cinquième vertèbre lombaire et le plan de la marge du bassin. L'analyse d'une série de cas montre que cet angle est très variable. Les limites de sa variation avec la position sont démontrées.

Quand l'inclinaison est considérable la tête ne s'engage pas facilement même si les dimensions sont normales, et une grande inclinaison est une des causes les plus fréquentes d'une dystocie inattendue.

Comme ces cas sont généralement choisis pour une "épreuve de travail", des critériums sont nécessaires pour aider à la sélection des cas appropriés. Le succès ou non de l'épreuve de travail dans ces cas dépend de l'espace dans le bassin supérieur. Les auteurs démontrent que cet espace dépend non seulement de la grandeur du conjugué vrai, mais aussi de l'inclinaison du sacrum, qui est très variable, et décrivent une méthode pour la mesurer. Un type de bassin qui cause souvent une dystocie a une marge très inclinée et un sacrum relativement vertical et convexe. Les bassins de ce type ne peuvent pas toujours être placés dans une des catégories classiques.

L'utilité et les limitations du traitement postural de ces cas sont discutées.

ZUSAMMENFASSUNG.—Die Einstellung des Kopfes hängt nicht nur von der Grösse und Form des des Beckeneinganges ab, sondern auch von seinem Neigungswinkel. Verff. diskutieren die verschiedenen Methoden zur Bestimmung dieses Winkels und kommen zu dem Ergebnis, dass der Winkel zwischen der Beckeneingangsebene und der Vorderseite des 5. Lendenwirbelkörpers den besten Anhaltspunkt zur Bestimmung dieses Winkels abgibt. Die Analyse einer Reihe von Fällen