V O L U M E II.

a study

of

the operation of

S Y M P H Y S I O T O M Y

and the

TRUE SIGNIFICANCE

of section of the pubic symphysis

and the

subsequent movements of the innominate bones.

by

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PREFACE.

In presenting this volume for graduation I venture to remark that there will be found in it some f facts and methods not hitherto described. Although based on the same cases as my previous thesis for the Gunning Victoria Jubilee Prize, it varies not only in substance but also in the description of a third movement of the innominate bones never hitherto described, and in many other ways, from that thesis.

May I venture to acknowledge here my deep sense of the kindness and special facilities offered me by Professor Simpson and Dr. Barbour, my former Principal.

Alfred C. Sandstein.

April, 1901.

C O N T E N T S

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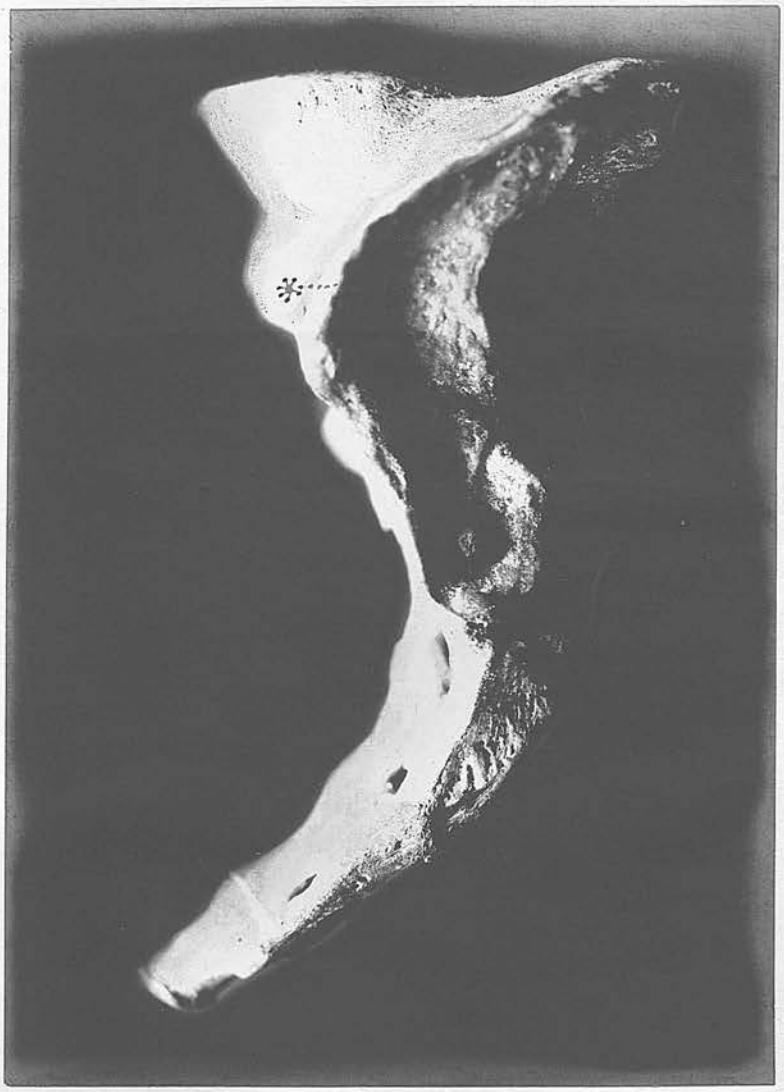
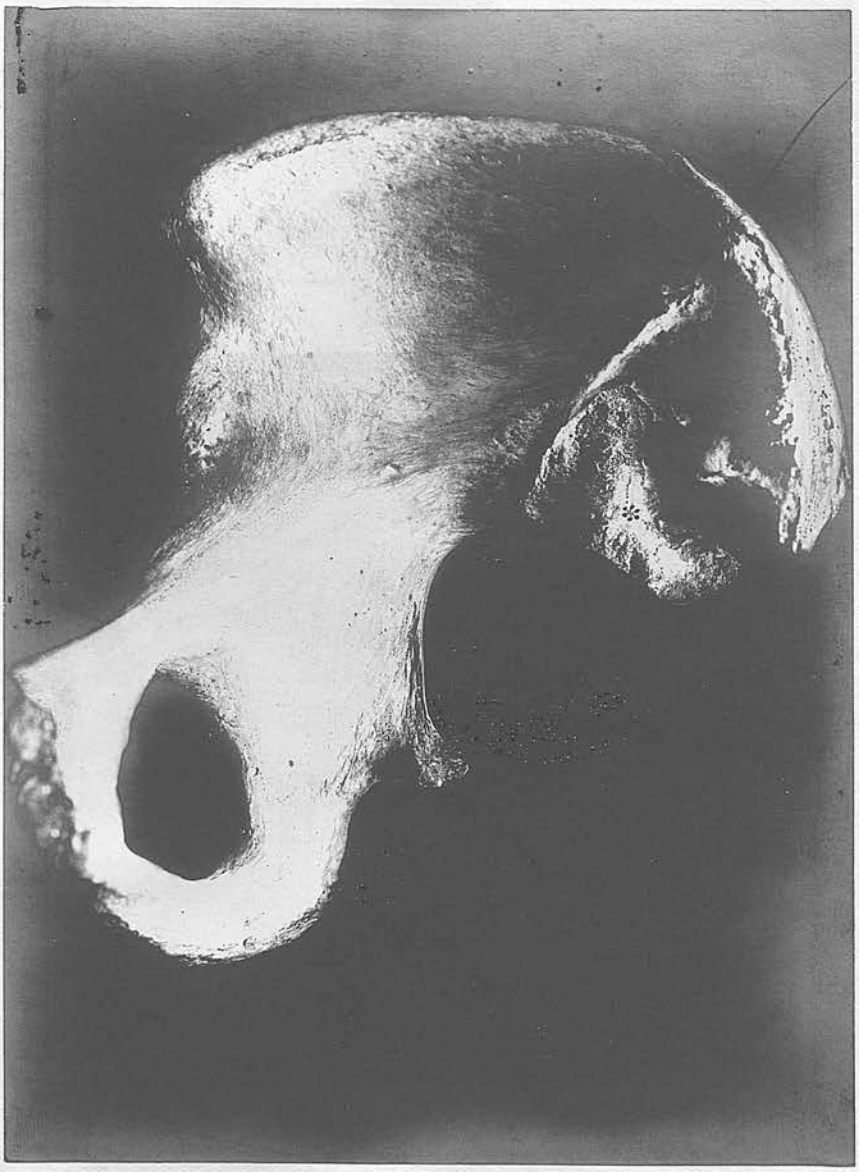


Os Sacrum.

✲ elongated groove.



Os Innominatum.

* elongated ridge.

CHAPTER I.

Outline of the history of Symphysiotomy.

Symphysiotomy is always connected in one's mind with the name of the French physician Sigault. While still a student in 1768, he made the proposal, to enlarge the pelvic inlet during labour by section of the Symphysis pubis, to the Royal Academy of Surgery of Paris. His suggestion was contemptuously disregarded, but was in 1773 made the subject of a thesis at Angers by Sigault, and in 1777 he, assisted by Leroy, performed the operation on his first case. The result was the saving of both mother and child, although the parent was left with permanent incontinence of urine.

The honours showered on Sigault by the Faculty of Medicine at once produced in the ranks of the Profession, a tremendous amount of opposition to the operation. It was doomed, as many and greater discoveries have been, to pass through a period of opposition and of obloquy; but, unlike them, so far prolonged, that it is only within recent years that the operation has established itself as a recognised aid in the delivery of the child.

So bitter at first was the opposition, that attempts were made to wrest even the credit of its

first discovery and performance from Sigault.- Says Baudeloque:- "Severin Pineau had recommended it "near two hundred years before him; - - - But he pro- "posed nothing to favour the separation; except "baths, emollient lotions, and the application of fat "and mucilaginous substances; - - - but M. Sigault "thought it more expedient to cut the knot than to un- "tie it." Alphonse Leroy stated that a Frenchman, Jean V. C. Delacourvee, performed it in Warsaw in 1655, but post mortem, on a woman of 48, who died after a labour of four days. It is also stated that Plenck of Bude, in Hungary, performed it in a case of post mortem Caesarean section in 1766.

The reason of the mortality which caused the opposition.

The operation was at first done in many cases where it was quite inapplicable. As Baudeloque says, "They all met with nothing but insurmountable obsta- "cles to delivery; and could find no resource but in "section of the pubes; for it was performed more times "in the space of four or five years, than the Caesa- "rean operation had been in the course of twenty or "thirty or perhaps in half an age."

Sigault's first patient had a conjugata vera of

$3\frac{1}{2}$ inches; his fifth one of under two inches. Naturally the result in the latter case was very bad; and indeed in his declining years, Sigault lost heart in his own operation.

It is abundantly evident from a consideration of previous Symphysiotomies that it is extremely desirable for the success of the operation, as of any operation, that the case should be a suitable one, and therefore that the conjugata vera must not be under a certain limit. To know this limit we must know:-

(1) What amount of separation of the pubes is safe.

(2) What gain in the conjugata vera, a given amount of separation of the pubes will yield.

Aim of the research.

This then is the aim of the research. (1)First of all to find out what amount of pubic separation is safe. (2) Secondly what gain in the conjugata vera, that separation of the pubic bones will give. (3) The consideration of these will lead to a discussion of the movements of the bones that occur during separation of the pubes, and (4) Fourthly the practical results of such a study.

It will easily be seen that, as Symphysiotomy is an operation which is designed to effect the delivery of the child without detriment either to mother or child, it is of primary importance that we should know what amount of separation of the pubes is safe, in order that we shall not exceed that safe amount of separation; and secondarily that we should know what amount of increase of the conjugata vera that safe amount of pubic separation will give, in order that we may confine the operation to such patients, as in whom the addition of that increase which the safe amount of pubic separation will give, to their originally shortened true conjugate, will allow a living foetus to be delivered. Once, therefore we have settled these two points, we can fix our limit. That is to say, no patient should undergo the operation, unless the true conjugate is of such length, that the addition to it of the increase provided by a safe amount of pubic separation, will make it of such a size as will allow the foetal head to pass through the inlet.

Owing to the rarity at the present time of deaths among pregnant, parturient or puerperal women, most of

my observations have been recorded on women in none of these conditions; although I have had instances of all of them. This however does not negative the value of the results obtained, even if it modifies it at all; because the condition of the bones is the same in a nulliparous, or parous, or nonpuerperal woman as if she were in the opposite condition; and the relation of the bony parts to one another remains unaltered by the various stages of the reproductive process.

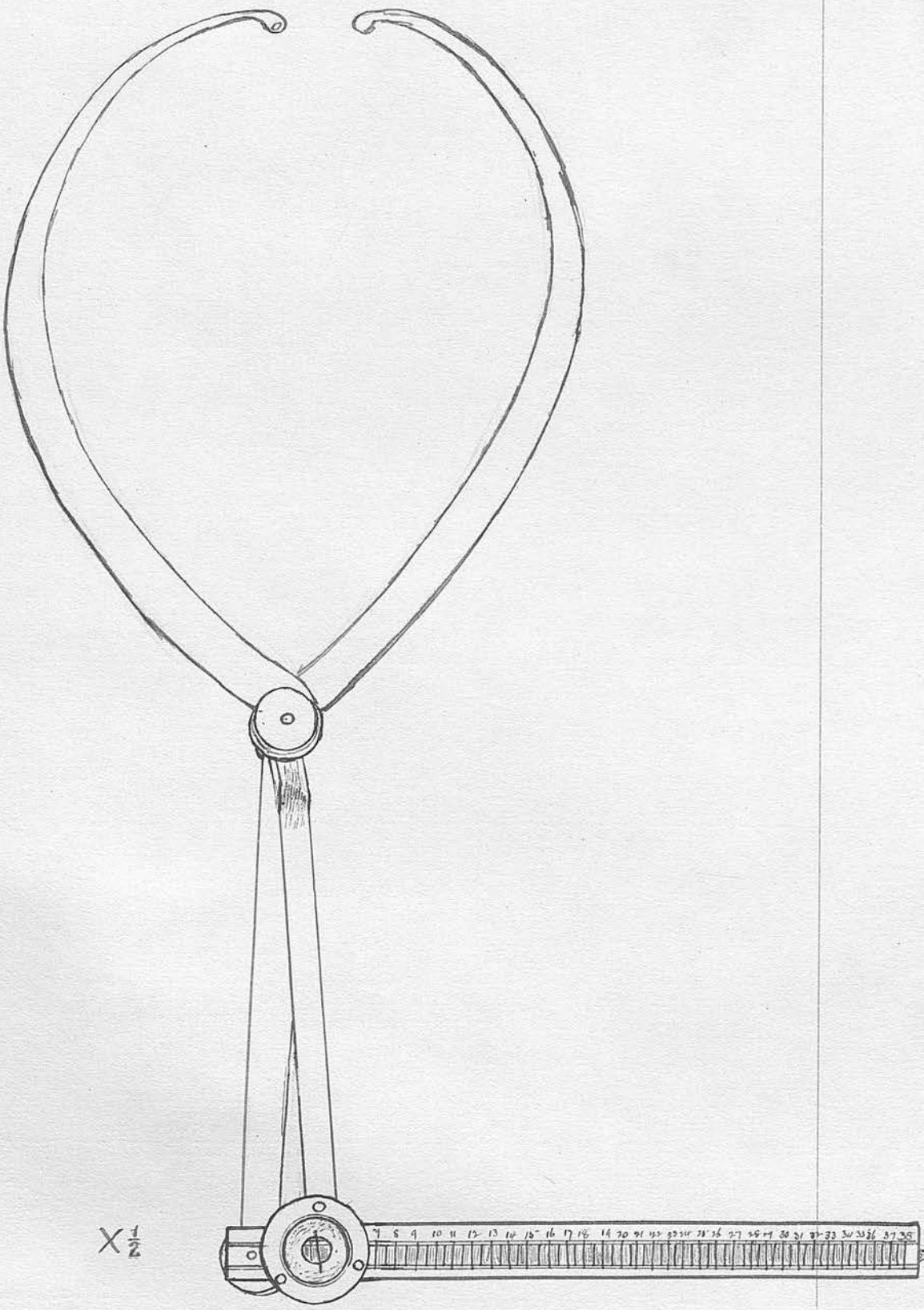
Therefore one can with just as much accuracy, calculate the amount of gain got by a certain amount of separation of the pubes, on a nonpregnant as on a pregnant pelvis. Moreover it enables us to see by contrast of the effects produced on the soft tissues of the nonpregnant with those on the soft tissues of the pregnant pelvis, how the very fact of pregnancy, itself renders symphysiotomy, not only easier in its performance, but safer, and more effective in its results. That is to say, that the separation of the pubes after symphysiotomy is much more damaging to the soft parts of a non-pregnant than it is to those of a pregnant pelvis. Thus if a certain ligament does not yield in a nonpregnant pelvis at a certain point of pubic

separation, it follows that it would not do so at that point in a pregnant female, but would require more separation of the pubes.

Technique of experiments.

To determine the two factors laid down as necessary, namely:- (1) the safe amount of pubic separation. (2) the increase that that yields, it is necessary first of all, to know the length of the various diameters with the pelvis in its natural state. In all cases the patient was lying on her back. The innominate bones were stripped of their coverings, the iliac crests defined, the iliac fossa cleared out, and the brim defined, with the least disturbance possible of the ligaments and other soft parts. This done, those diameters whose extremities were not marked out by definite points were dealt with. Thus, the two points of the iliac crests between which lay the intercristal diameter, were first settled, and a small saw cut made at these points in the bones. Then the transverse diameter of the brim was determined and the brim marked by two small saw cuts at the two points between which it lay. Finally two more saw cuts were made on the brim opposite the two ilio-pectineal

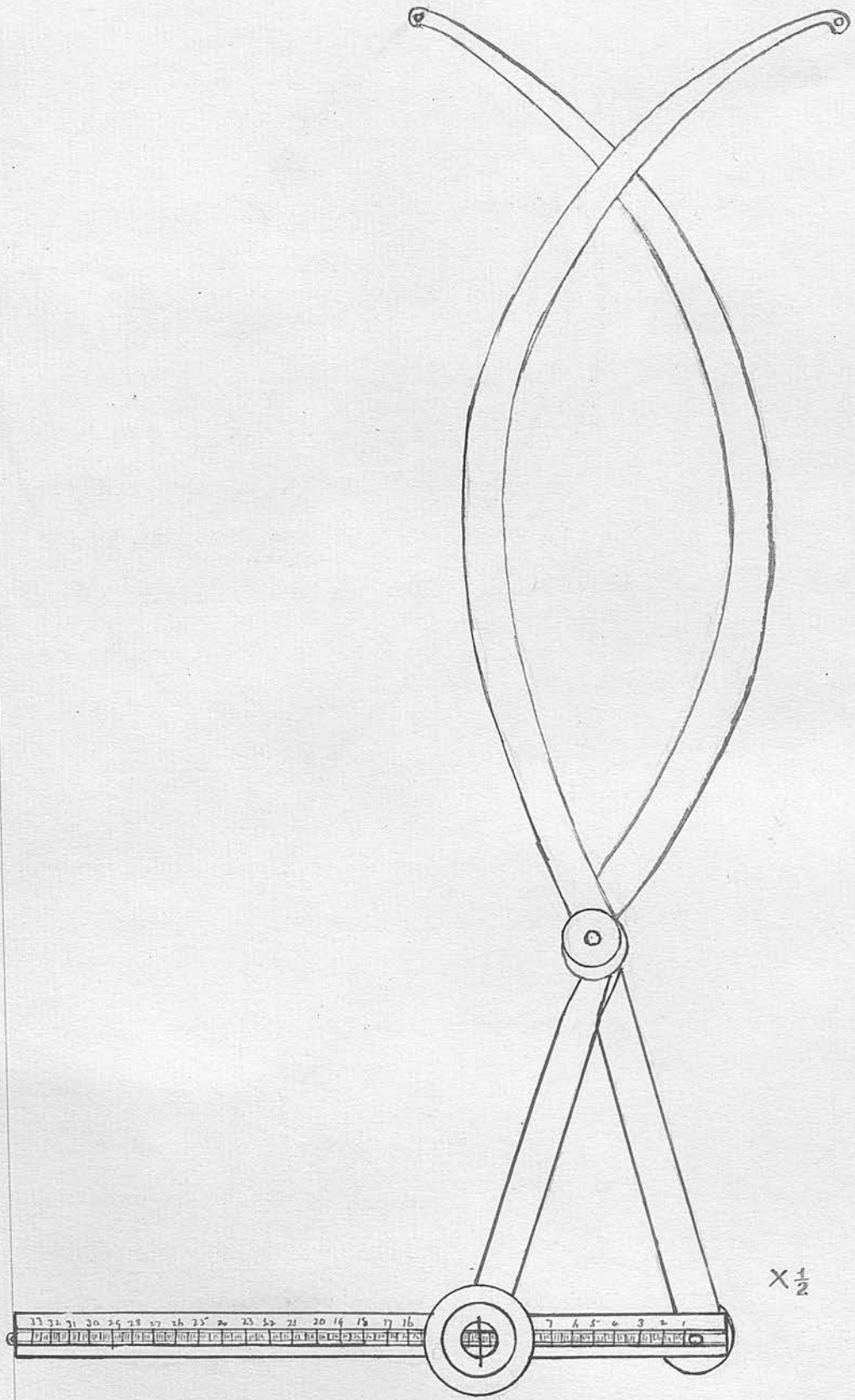
Drawing 1.



X 1/2

Prowchownik's callipers.

Drawing II



Prowchownik's callipers.

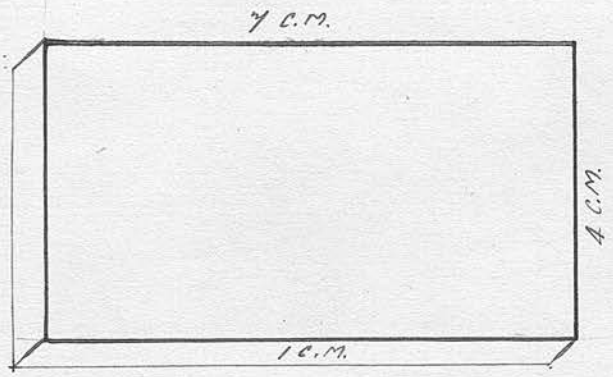
eminences. This was done so that fixed points might in every case mark the terminations of the diameters; so that after each access of separation of the pubic bones, the measurements might be again made between the same two points, and thus a true comparison be made between the various lengths of the same diameter under altered conditions. I was compelled to limit myself to the diameters of the false pelvis and brim of the true pelvis as the soft parts could not be removed sufficiently to get at the cavity and outlet of the true pelvis accurately.

Callipers. (Drawing I and II.)

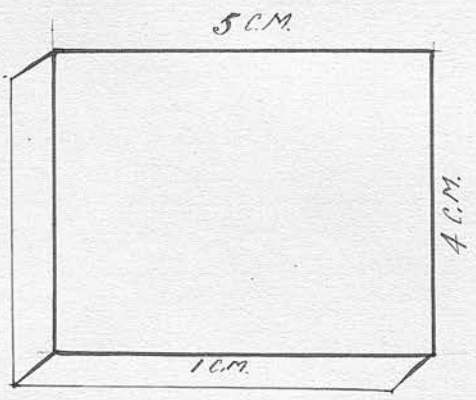
The instrument used was lent me by Professor Simpson, to whose kindness I am in many ways indebted. It was Prochownik's callipers, and its great advantages were not only its great accuracy and that measurements were in millimetres, but also the arms of the instrument could be crossed, and it could be used to measure the internal diameters, by the simple expedient of closing the handles, swinging round the graduated bar on the pivot thus formed at the extremity of the handles, and crossing the arms, now reading the measure from right to left. The method of marking the distance by thin wire stretched across the disc on the

Drawing III.

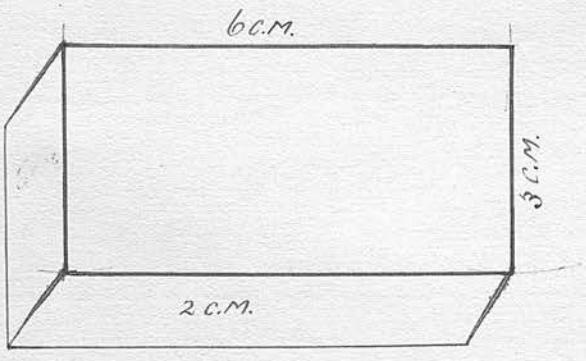
a.



b.



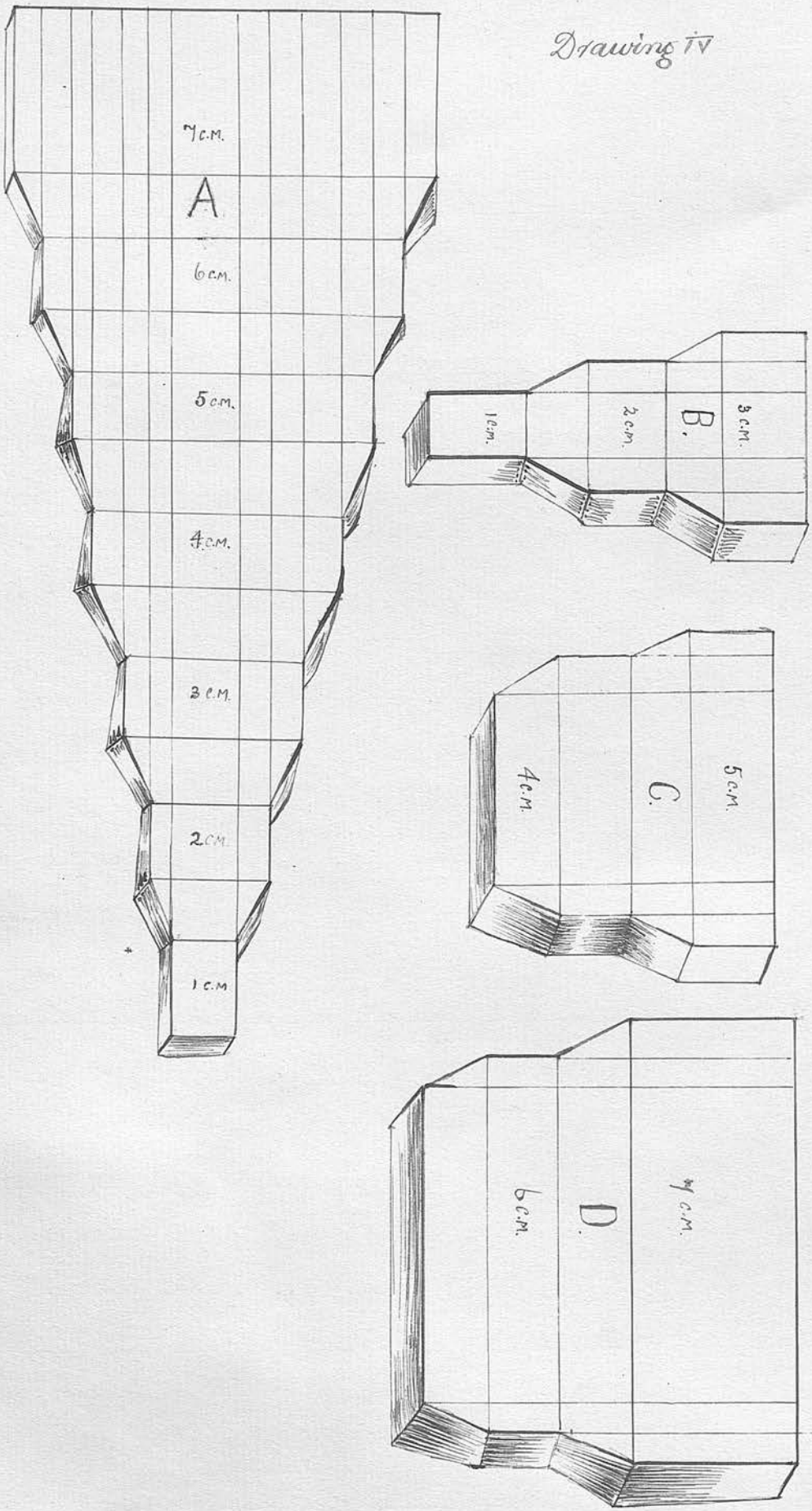
c.



graduated bar ensured great accuracy.

Having made these measurements in the natural state, the symphysis pubis was next divided in the way to be described later, a catheter having been previously passed into the bladder. It was separated by means of three flat ebony discs (ebony being selected because of its extreme hardness) rectangular in shape, and of a length and breadth and thickness varying from 1 C.M. to 7 C.M.; so that by means of these placed between the pubes, the separation could be carried from 1 C.M. up to almost any extent, gradually (see drawing III) In cases where the separation of the pubes was difficult, I used a wedge-shaped piece of wood to carry it out. Reference to Drawing IV will show the design of this wedge. It was made of Spanish mahogany, and consisted of a rectangular alternating with a wedge-shaped piece in regular succession; so that the first rectangular piece was 1 C.M. broad, and was succeeded by a wedge-shaped piece the diameter of which increased gradually from 1 C.M. to a rectangular area 2 C.M. broad. This again was followed by a wedge-shaped portion, increasing gradually in size from 2 C.M. to another rectangular area 3 C.M. broad;

Drawing IV



and so on up to 7 C.M., wedges alternating with rectangular pieces in regular succession. The whole wedge was divided into three parts. The smallest wedge (Fig B) was 1 C.M. at its apex and 3 C.M. at its base. The middle piece (Fig. C.) fitted exactly on this, and began with a wedge-shaped area 3 C.M. broad at its apex which increased to 4 C.M. It was 5 C.M. at base. The largest piece (Fig. D.) again fitted exactly on this: and contained areas 6 and 7 C.M. in diameter.

When the pubes were unusually difficult to separate, the 1 C.M. end of the smallest piece (B.) was first introduced between them. Then a little pressure insinuated gradually the succeeding expanding wedge between the pubes till the 2 C.M. part slipped between them, and so on till 3 C.M. of separation was reached. The middle piece (C) was then used. Its apex (3 C.M. broad) just fitted over the base of B. and the expanding wedge-shaped part could be gradually forced between the pubes till 4 C.M.M. of separation was reached. Then the small piece (B.) would be slipped out. The separation could be carried on to 5 C.M., and by repeating the preceding manoeuvre with D., on to 6 and 7 C.M. This could be further increased by slipping in beside

it, a piece one or more centimetres broad.

After each increment of separation of the pubes, the ligament of the joints were examined; and the other soft parts; and where time permitted the various diameters were measured. But in most cases this could not be done; and although the separation of the pubes and examination of the joints, etc., were carried out step by step, the measurements were only taken after the full extent of separation was reached.

Finally the sacroiliac joints were cut into, and their surfaces examined and cavities probed.

CHAPTER II.

"What amount of pubic separation is safe."

Separation to be very gradual.

In order to see what amount of separation of the pubes will be safe, it is necessary to consider the effect of gradual separation on the various portions of the pelvis and its contents. I say advisedly, "gradual" separation because it is a sine qua non. Any attempt at forcible separation such as Cazeaux implies in his midwifery book, will be at once followed by disastrous results such as rents of the vagina, tears of the vulva, or tearing of the urethra, with haemorrhage &c. This could easily be seen in the cadaver, where any too forcible effort at separation invariably caused some such result.

The movements which take place at the sacroiliac joint will come up for discussion in the proper place; and we will consider first of all the sacroiliac joint, its ligaments, and the interior of the joint itself.

The Sacroiliac joint

The Sacroiliac joint is composed of the articulating surfaces of the ilium and sacrum. It is not a synchondrosis, as it used to be thought, but it is capable of some slight movement. Zaglas, Matthews Duncan, Wood, and others maintain that there is movement

Movement in the joint

in the sacroiliac joints not only in the pregnant, but also in the non-pregnant condition. "The move-"ments which occur may be described as consisting in "the elevation and depression of the symphysis pubis, "the ilia moving on the sacrum; or if the sacrum be "regarded as the moving bone, it describes a nutatory "motion upon an imaginary transverse line passing "through the second bone. By the elevation of the "symphysis pubis (or nodding forwards of the promon-"tory) the angle of inclination of the pelvis is les-"sened and the conjugate diameter of the brim of the "pelvis is diminished to the extent of one or even "two lines." (Matthews Duncan.)

The discussion of this subject of movement at the joint is not of merely academical interest, but has a special bearing on this thesis. So that I shall pursue the subject a little further.

Lenoir found that in females between 18 and 35 years, the joints had a simple sliding motion.

Cazeau, speaking of the sacroiliac joint, says that the very limited sliding movement which can occur in the joint represents a considerable dip of the pubes.

Parvin allows only a movement such as occurs in the vertebral joints.

Walcher experimented on a woman who died of Eclampsia, and found that the difference between the conjugata vera when the thighs were bent up on the abdomen and when the legs were allowed to hang down and to drag at the pubes, was 8 M.M. This led to the adoption of "Walcher's position" in labours where the head has difficulty at the brim. The patient is put in the lithotomy position, but with the legs hanging down. Thus their weight drags on the pubes, and brings into action the mechanism described by Duncan, the ilia rotating on the sacrum so that the pubes are depressed, and the conjugata vera increased.

Klein of Wurtzbourg confirmed this (Zeitsch f. Geburt, und Gyn, 1891), and said it occurred in all pelves (except where there is ankylosis of the sacroiliac joints), at all ages, in both sexes, and in all forms of pelves (normal or pathological.) It is not influenced by age, and is more marked in contracted than in normal or uniformly large pelves.

Pinzani (Ann. de Gyn. 1899) confirms the statement

of Klein that the increase of the conjugata vera is greater in deformed pelves ("dans les bassins viciés") than in normal ones.

Korsch (Zeit. f. Geburt. und Gyn. 1881) experimented on 65 pelves and confirmed Walcher's results.

Balandin confirmed the existence of the movement.

Lebedeff and Bartoszewicz (Ann de Gyn. 1899) confirmed Walcher's results, experimenting on 25 adult and 2 infant pelves.

Bonnaire and Bué experimented on a number of pelves and confirm Walcher's statement.

Pestalozza also adds his support to Walcher's statement.

In the cow during parturition, such a rotatory movement of the innominate bones on the sacrum is described.

Having indicated the opinions on the subject shortly, above, I shall roughly describe the joint. It is composed of the articulating surfaces of the sacrum and ilium. Each articular surface consists of

movement at sacroiliac & pubic joints occurs in cases of ankylosis of the hip joint

an anterior or inferior, and a posterior or superior part.

The anteroinferior part consists of the auricular surface covered by cartilage firmly adherent to the subjacent bone, and having the same contour.

The iliac auricular area corresponds in shape with the sacral.

The superior and anterior sacroiliac ligamants are thin and feeble, and cover in the joint above and in front. The posterior ligament binds the bones together posteriorly, firmly and immovably, extending between the posterior part of the lateral aspect of the sacrum and the corresponding rough surface on the ilium posterior to the auricular surface. It includes the oblique ligament which extends from the posterior superior iliac spine to the lateral tubercle on the third piece of the sacrum. The posterior sacroiliac ligament is the centre for movement of the innominate bones. The greater and lesser sacro-sciatic ligaments extending between sacrum and coccyx, and the ischium also give assistance to the other ligaments in binding the bones together.

ffect of
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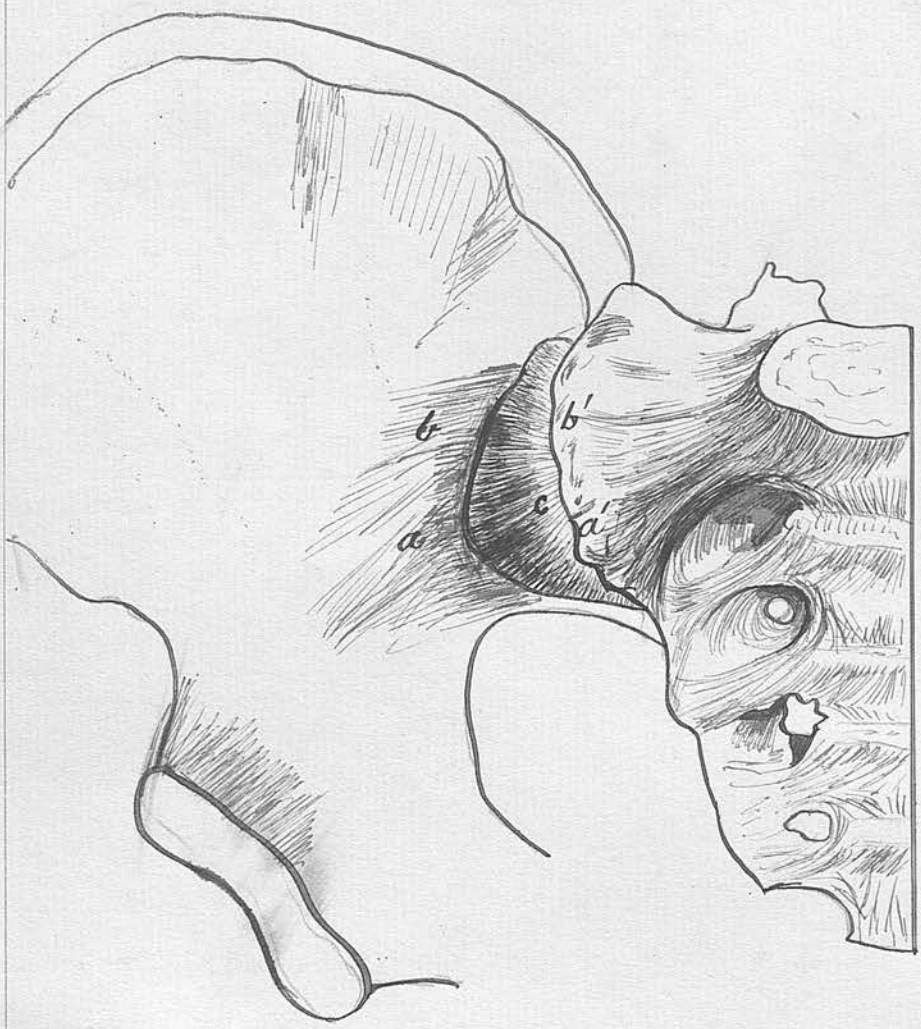
ation on
ie sacro-
liac joints.

The movements that occur at the pubes are reflected in miniature at the sacro-iliac joints. The

Drawing V.



Sacroiliac joint

after a pubic separation of 8 c.m.

semi diagrammatic.

a . a' salient angles of auricular surfaces between which is widest separation.

b . b' b project distinctly above level of b'.

c is placed in triangular aperture between auricular surfaces.

whole movements occur on the centre of action of the posterior sacroiliac ligaments as a centre, and the articular surfaces being so much nearer this centre than the pubes are, thus a large movement at the symphysis represents a much smaller one at the sacroiliac joint.

The separation of the pubes is thus evidenced by a separation of the sacral and iliac articular surfaces, increasing with the increase of pubic separation. The separation of the sacral from the iliac articular surface is always greatest between the salient angles of the auricular surfaces, much greater than below, or postero-superiorly to that point. (See Drawing V.a.a.) This the space between them is triangular in shape (Drawing V.), the base of the triangular aperture being situated between the salient angle, from which point, passing backwards downwards and inwards, it gradually narrows to the apex at the posterior margin of the joint. The upper or superior and the lower or anterior margins of the auricular surfaces thus are widest separated between the salient angles, and behind that the two upper margins approach one another, and so do the lower or anterior.

After the separation had been carried to its fullest

extent, I made a point of cutting the superior and anterior ligaments, and exploring the joint on either side, with a probe. The surfaces were separated almost throughout, but the interval between them narrowed, till at the posterior end of the lower or horizontal limb of the auricular surface, they were in contact.

The lateral margin of the base of the sacrum (at the upper edge of the auricular surface), although at first flush with the corresponding border of the innominate bone, with each access of separation of the pubes, increasingly projects above the level of the innominate, so that the salient angle and to a lesser degree as you pass backwards, the upper edge of the sacral auricular surface is elevated above the level of the corresponding point and margin of the ilium.

Sacroiliac ligaments The Posterior only slightly affected.

The posterior sacroiliac ligament binds the sacrum and ilium together posteriorly to the joint, and acts as a centre on which movements during separation of the pubes, occur. In one case I excised the sacroiliac joint after the pubic separation, and the posterior sacroiliac ligament on attempting to renew the separation of the joint surfaces, permitted only separation anteriorly. Rotation of the iliac portion downwards was easy but limited and

gave the ligament a slightly spiral twist downwards.

The Anterior and the Superior are apt to tear. Tear begins at a special point.

The Anterior and Superior sacroiliac ligaments suffer most. They are very apt to tear. This tear in almost every case began not in the anterior sacroiliac ligament, but in the superior sacroiliac ligament just posterior to a line between the salient angles of the auricular surfaces. (See Table C. and Drawing V.) Of course in a few cases it appeared elsewhere at the same time, and in every case it passed in both directions from the point when the separation of the pubes is continued further than the amount of separation at which the tear began. But in practically every case it began at that point. (See Drawing V.a a) This is due to the projection of the sacral auricular surface at its salient angle above the level of the salient angle of the iliac auricular surface. Thus the laceration of the superior sacroiliac ligament begins just where, passing over the salient angle of the sacral auricular surface, it joins the anterior sacroiliac ligament.

Conditions governing rupture of ligaments.

The amount of separation of the pubes required to cause their rupture varies with certain conditions.

(1) In my experiments, in nulliparous pelves

they ruptured soon, in parous pelves not so early as in nulliparous: and in pregnant or parturient pelves they stood the strain so well as to require a much larger amount of separation to rupture them.

(2) In these (postmortem) experiments, the longer the patient was dead, the sooner they ruptured.

(3) The rapidity of separation of the pubes affected it. If they were separated quickly, the ligaments tore soon.

(4) In some cases the periosteum over the innominate bone to which the ligaments were attached, especially the anterior, was raised off the bone by the traction of the tense ligament. Of course where this occurred, they were less liable to tear, as a bridge of tissue was, as it were, thus made across the recess in front of the sacroiliac joint. Whether this raising of the periosteum off the bones is good or bad, I can scarcely say.

(5) Finally in some cases the sharpness or irregularity of the edges of the bone may cut or pierce them.

Referring to Table C.-

In 25 cases with pubic separation of 1 C.M.								no ligamentous tear.	
" " " " " "						2	"	"	" "
" 6 "	or 24%	"	"			3	"	"	there was ligamentous tear.
" 3 "	or 12%	"	"			4	"	"	" "
" 2 "	or 8%	"	"			5	"	"	" "
" 3 "	or 12%	"	"			6	"	"	" "
" 1 "	or 4%	"	"			7	"	"	" "
" 4 "	or 16%	"	"			8	"	"	" "
" 6 "	or 24%	"	"			8	"	"	no ligamentous tear.

The left sacroiliac ligament only, tore in 10 cases

" right " " " " 5 "

Both right and left sacroiliac ligament tore in 4 cases.

(Left 1st in 2 cases)
( )
(Right 1st in 1 case.)
( )
(Both at once in 1 case.)

Neither tore at all in 6 cases.

So that in 44% of the cases none of which were pregnant and some were nulliparous, the tear began at below 6 C.M. of separation of the pubes. In 56% the tear began at or above 6 C.M. of pubic separation. In 44% it began

only at above 6 C.M. of separation. Of 3 cases in various stages of pregnancy, they were never ruptured at all in one case, and in the other two cases only at 8 C.M. of pubic separation.

Other tissues near sacroiliac joint.

The effect on the other tissues near the sacroiliac joint, is not marked.

Periosteum and tissues in front of the joint.

The Periosteum may be raised off the inner aspect of the innominate bone, and in such cases, the ligaments are not so apt to yield. The amount of movement at the joint is so slight relatively to the amount of movement at the pubes, that the tissues in front of the joint are but little put upon the stretch.

Mons Veneris.

During division of the symphysis pubis, damage to the parts around it was carefully avoided. An incision had for the purposes of the postmortem, been already carried down to the Mons Veneris. This was not prolonged, but the tissues were separated off the front of the pubes down to the clitoris which was often difficult to separate from the bone.

The effect of the separation of the pubes on the tissues of and around the vulva, was marked. In many

cases in spite of the tissues being slackened by the large abdominal incision, and by the detachment of the abdominal walls from the iliac crests and from the front of the pubes, the incision into the mons veneris extended gradually downwards. This did not happen when the amount of pubic separation was small. There would be no appreciable effect until 4 C.M. was reached. After that a great strain was thrown on the tissues of the mons. It usually stood the strain well up to 6 C.M. When the pubic separation was carried to 7 C.M. in a good many cases the incision extended downwards into the mons. Naturally when it was still further increased to 8 C.M. in a still larger number of cases its tissues tore, and in a very few cases, perhaps one or two, it tore almost completely through its length.

The Vulva.

The vulva also was affected. In only one case (case I), a nullipara did the tissues tear in this region. In this case it was the vestibule that gave way with a separation of only 6 C.M. But in every case, as the distance between the bones increased, so did the amount of stretching of the tissues between them, especially the vestibule. When the amount of pubic separation was increased up to 7 or 8 C.M., the structures

between the anterior parts of the labia majora, and also the vaginal orifice were stretched like a drum between the separated pubes, and were thrown into ribbed or transverse folds stretching from bone to bone, (reminding one of the undulations in"corrugated iron"). With lesser degrees of separation a state of matters less damaging, existed. Up to 5 or 6 C.M. of separation, the tissues bore the strain very well. After 7 C.M. it was clear that with any further degree of separation in the living subject, there would be a great risk of necrosis and sloughing of the stretched tissues. Of course, in a pregnant and, even more so, in a parturient woman, the vulva is softened and swollen by serous infiltration, etc.; but still the sight of a pelvis with its pubes separated up to 7 or 8 C.M. with a huge gap extending between the pubic bones, the contour of the inner and anterior margins of which can be seen under the skin; with the mons veneris lacerated and the tissues of the vulva tightly stretched between the bones, corrugated transversely and slightly concave anteriorly owing to the traction of the vagina at the vaginal orifice upon its lower part, cannot but make one feel that such a separation will scarcely fail to damage these structures to a more or less large extent

The Bladder and urethra.

Before the section of the symphysis I always passed a gumelastic catheter into the bladder per urethram, so as to empty the bladder and also to define it and the urethra. In no case did the section and the subsequent separation of the pubes damage them, although the urethra might in life be harmed by the damage done to vulva and vagina by excessive separation of the pubes.

The Vagina.

The vagina is only affected by the operation at its orifice, and there it is to a certain extent stretched along with the vulva. The roof of the vagina just inside its aperture stretches and becomes very tense, although cases of its tearing did not occur in my experiments.

Having considered the effect upon the various parts of the pelvis as regards damage by the varying degrees of pubic separation, in my experiments, it is now possible to estimate what amount of pubic separation is safe. In trying to do this we will consider the parts again in detail and compare my experimental results with those obtained in a series of over 300 cases of symphysiotomy performed during the time from the end of 1892 to the beginning of 1899, which I have collected

from British, German, American, Italian, French and other sources.

Safe amount of separation for (1) Sacro iliac joints.

First of all dealing with the Sacroiliac joints, various opinions have been expressed with regard to the amount of pubic separation which is safe for these joints.

Authors' opinions.

V. Cocq (Jour. de Med. de chirurg. et de Pharm, 1893) says that the maximum amount of separation at the point of section with safety to the sacroiliac joint is 6 C.M.

Puiard says 6 C.M.

Doederlein and Morisani separated the pubes up to 5 C.M. without lesion of the sacroiliac joints.

Halliday Croom puts the safe amount of separation as 2¾ inc(about 6.5 C.M.) and states the dangers to the joints as "suppuration of - sacroiliac joints, caries, non union."

My own opinion.

My own opinion may be shortly stated in the words that "the danger of separation of the pubes has no reference at all to the sacroiliac joints". That, therefore , we need not limit the amount of pubic

separation, if it were not for the sake of other structures.

I will give first my reasons for this statement and will then support it by reference to recorded cases.

It cannot be said that there lies any danger in regard to the sacroiliac ligaments. The only really important ones for binding the bones together are the posterior sacroiliac and the greater and lesser sacrosciatic ligaments. Rupture of these would be serious. But they are never in danger of rupture; rather are they slackened and relaxed by the approximation of the bones they lie between. For the part of the ilium, posterior to the articular area approximates itself during pubic separation to the back of the sacrum, thus relaxing the posterior sacroiliac ligament: while the descent of the innominate bone, which, (it will be my duty to prove it later) , occurs during pubic separation, relaxes the sacrosciatic ligaments.

On the other hand the anterior and superior sacroiliac ligaments are in danger of rupture although in 44% of 25 cases which included only three cases in the pregnant condition, the tear of the superior sacroiliac

ligament only began at 7 C.M. of separation or over that. Yet these two ligaments merely form a thin sheet covering in the joints above and in front. In pregnancy they are so lax as to stretch easily and well; and if they do rupture, the mere fact of their being ruptured would not delay healing in the joint.

Again with regard to separation of the articular surfaces themselves, there is a fallacy existing in our mental conception of the state of affairs. A simple simile will serve to explain what I mean. Given that a man's head is separated from his body at all, it cannot make any difference to him if the distance of the severed head from the trunk is an inch or a mile, he will be dead all the same. So it is with the sacral and iliac articular surfaces. Separate them from one another; and the mischief is done! A distance between the pubes of 3 or 4 C.M. will certainly separate the articular surfaces, and there the matter ends. A pubic separation of 8 C.M. can do no more.

Reference to recorded cases will support my statement. Several cases are recorded where pain persisted for some time in the sacroiliac joints. Such a case was that performed by Koffer, March 6th, 1893,

on a woman of 38 years, with a rickety pelvis which had previously necessitated craniotomy. The conjugata vera was 7.5 C.M. There are no cases among the over 300 that I collected that had for sequelae such complications as caries, nonunion or suppuration in the sacroiliac joints.

What has been recorded is that in several cases where the patient died a few days after the operation; rupture of the anterior sacroiliac ligaments was present. This I regard as a mere nothing, which, had the patient lived, would have never been known to exist. In no case that I have heard of, performed on a pelvis which offered the least chance of delivery by symphysiotomy (thereby excluding such cases as Sigault's fifth case) has there ever been found any suppurative lesion of the sacroiliac joints, caries or necrosis.

There may, however, exist danger for the sacroiliac joint. For the healing process in the joint must necessarily depend not so much on the condition of the anterior and superior sacroiliac ligaments as on the accurate apposition of the joint surfaces to one another. This accurate apposition depends on the accurate apposition of the pubic bones to one another.

If these are brought accurately together the sacral and iliac articular surface also will be. Overseparation of the pubes may result, as I shall show, in lesions round the site of the symphysis which may interfere with that accurate apposition, and might thus cause maladaptation of the sacroiliac surfaces.

Mons Veneris.

The tissues round the symphysis pubis as I have shown, were in my experiments ~~shown to be~~ greatly affected by excessive separation. The Mons veneris had a great strain thrown upon it at 4 C.M. of separation and 6 C.M. was in most cases the limit of its endurance. Recorded cases do not give any injury of this.

Vulva.

The vulva bore the strain fairly well up to 6 C.M. and usually 7 C.M. After 7 C.M. it was clear that the danger to the tissues was great.

The Bladder Urethra, and Vagina.

The Bladder and Urethra were not greatly affected by the separation in my cases, but the Vagina at its orifice is greatly stretched along with the vulva. The strain lies across the long axis of the urethra here, and so does not affect it unless the vaginal

orifice should tear in its roof.

Conclusions as to dangers of excessive pubic separation and as to maximum safe amount.

From a consideration of my experiments I conclude that the danger of symphysiotomy with excessive pubic separation lies (1) Not in the sacroiliac joints, the tissues near these joints nor (2) "perse" in the bladder, urethra or vagina, but (3) in the vulva especially the vestibule which by excessive strain may tear; and in the extension of vestibular tears to the adjacent anterior wall of the vagina ~~at its~~ orifice with the contained urethra, and to the bladder: (4) that the maximum amount of pubic separation should be 6 C.M., and should in no case exceed 7 C.M.

Agreement of these conclusions with the results in over 300 cases recorded from 1892 to 1898, inclusive.

A comparison of these conclusions with the results of recorded cases shows almost complete agreement with facts.

(1) In some cases, as I have stated, more or less pain is recorded over the region of the sacroiliac joints, and in fatal cases a rupture of the anterior sacroiliac ligament which no doubt exists in many successful cases, and would never have given rise to any untoward symptoms, but, as it were, was merely found because death permitted examination.

I could find no record of any other results.

(2) and (3) my second and third contentions, that the danger lies in and around the symphysis pubis, are fu lly borne out. If the cases with complications and sequelae are collected, we get the following result:-

(1) Chinque Baudeloque. Nov. 93. Sepn. 6 C.M. small abscess in opn. wd. recovery.

(2) Tellier. July, 92. Sepn. 10 C.M. Tear to right of urethra. haem., from wound and post-partum haem., Death from loss of blood.

(3) Maygrier. Tear of ant., vagl. wall. Phlebitis of left leg. Death of embolism of right pulmonary artery.

(4) Budin. Feb. 93. Haem., from bladder plexus. Recovery.

(5) Rein. Haem. from wound. Recovery.

(6) Krassowski. Sepn. 6 C.M. Haem., from Corpus cav. clitorid. Recovery.

(7) Springle. Dec. 92. fistula till sequestrum eliminated from wound.

(8) Olshausen. Aug. 92 Death of Eclampsia.

(9) Kaschkaroff. Mar 93. Death of Eclampsia.

(10) Kreider. Mar. 93 Death of sepsis.

(11) Wertheimer. Mar. 93. Sepn 6.5 C.M. Death of sepsis.

(12) Chrobak. Mar. 93. Trans. tear. between clitoris and urethra. Urethra ruptured, Rupture of vagina and cervix and perineum. Death of sepsis.

(13) Frank. April 93. Death of double pneumonia.

(14) Braun. Ap. 93. Death of sepsis.

(15) Braun. May 93. Death of sepsis.

(16) Pinard. Jan. 93. Sepn. 4.5 C.M. Slight phlebitis of left leg. Recovery.

(17) Pinard. Mar. 93. Sepn. 6 C.M. Temporary incontinence of urine. Recovery.

(18) Pinard. Nov. 93. Sepn. 6.5 C.M. Right side of pelvis ankylosed. Tear of ant. vagl. wall. incont. due to vesicovaginal fistula as tissues were squeezed between the non-moving side of pelvis and foetal head. Recovery.

(19) Bidder. Transverse tear of right labium minus. Suppn. in wound. Recovery.

(20) Pinard. Dec. 95, Sepn. 5 C.M. Died of intestinal obstruction due to a band nipping bowel. not connected with operation.

(21) Ott. Sepn. 5 C.M. Tear of ant. vagl. wall wh., caused haem., Recovery.

(22) Bouffe de St. Blaise. June 94. Sepn 6 C.M. Death of septicaemia.

(23) Wallich. Sep. 94. Sepn. 5 C.M. Death of septicaemia.

(24) Porak. Sepn 5.75 C.M. Haem. in 3rd stage. Recovery.

(25) Pinard. Jan. 95. Sepn. 4 C.M. Death of Bronchi-ectasis, &c., not connected with operation.

(26) Varnier. Feb. 95. Sepn. 6.5 C.M. Phlebitis in left leg. Recovery.

(27) Wallich & Pinard. May 95. 6 C.M. tear internal to left Labium minus connecting operation wound with vagina. Recovery.

(28) Varnier. May 95. Mother died, not Sepsis. Cause unknown.

(29) Pinard. July 95. Sepn. 4.5 C.M. Tear of attachment of vagina to uterus after forceps and version. Recovery.

(30) Funck Brentano. Aug 95. Sepn. 6.5. C.M. Sutures suppurated. Phlebitis in left leg. Death sudden, by embolism, 46 days after operation.

(31) Bouffe de St. Blaise. Nov. 95 Sepn 6 C.M. Tear of soft parts between vagina and operation wound. Recovery.

(32) Pinard. Nov. 95. Sepn. 8.5 C.M. tear of vagina into wound. Recovery.

(33) Lepage. Aug. 95. Tear in upper and right part of vestibule. cystitis. Recovery.

(34) Lepage. Sep. 95. Haem., from corp., cav., clit., Recovery.

(35) Lepage. Sep. 95. Haem., from opern. wound. Tear transversely bet., clitoris and vagina. Incontinence of urine and vesicouterine fistula. Cure.

(36) Lepage Oct. 95. Sepn. 5 C.M. tear of anterior cervical lip. Right side moved more than left. Recovery.

(37) Audebert. Nov. 95. Sep. 5.5 C.M. fistula at upper end of wound Bronchopneumonia.and Peri-y. carditis.albuminuria. Recovery.

(38) Audebert. Dec. 95. Sepn. 4.5 to 5 C.M. Haem., from atonic uterus. Recovery.

(39) Lepage. April 95. Haem., from operation wound. Recovery.

(40) Lepage. Feb. 97. Sepn. 6 C.M. Temporary incontinence of urine. Recovery.

(41) Pinard Jan. 97. Sepn. 6 C.M. Communication between wound and vagina. Haem.,from operation wound and in 3rd stage. Haem.,post-partum. Death.

(42) Varnier. June, 97. Sepn.,4 C.M. Tear between vagina and wound to left of urethra. Recovery.

(43) Pinard. Dec. 97. Sepn. 5 C.M. Bleeding from vesical arteries. Recovery.

(44) Wallich. Nov. 96 Sepn.5 C.M. Vaginal tear. Recovery.

(45) Pinard. Nov. 96. Sepn. 5 C.M. Death of septicaemia.

(46) Varnier. April 98. Vaginal tear. Recovery.

(47) varnier. April 98. Sepn. 6 C.M. Rupture of vagina. Recovery.

(48) Bouffe de St. Blaise. April, 98. Sepn. 6 C.M. Rupture of vagina. Recovery.

(49) Funck Brentano. Aug. 98. Sepn. 6 C.M. Death of Eclampsia.

(50) Funck Brentano. Jan. 99. Sepn. 8 C.M. Tear of vestibule. Death of septicaemia.

(51) Polk. 1899. Rupture of urethra. Recovery.

(52) Krassowsky. Nov. 92. Sepn. 6.5 C.M. Cystitis. Recovery.

(53) Schwartzy. Oct. 92. Sepn. 7 C.M. Tear of lower uterine segment of left side. Eclampsia. Recovery.

(54) Schwartz. 1892. Sepn. 5 C.M. Death of sepsis.

(55) Baumm. Sepn. 4 C.M. pus from wound- necrosis - vesical catarrh. Recovery.

(56) Schauta. Tear of ant. vagl. wall to left of urethra and into neck of bladder. Recovery.

(57) Schauta. Haem from clitoris. Recovery.

(58) Schauta. Tear to right of urethra not into bladder. Recovery.

(59) Chrobak. Feb. 1893. Tears between clitoris and urethra. Urethra entirely torn. Recovery.

(60) Eckstein. April 1893. Death of sepsis.

(61) Kaschkaroff. Mar. 1892. Sepn. 3.5 C.M. Death of Eclampsia

(62) Leopold Febr.1892. Death in 4th week of Pulmonary embolism.

(63) Davis. March 93. Mother died in 72 hrs. of hypostatic pneumonia.

((64)Koffer. Haem in 3rd stage. Death of sepsis.

(65) Schwartz. Nov. 93 Sepn. 2.5 C.M. Recovery with prolonged incontinence of urine.

(65) Fritz. Sep. 92. Sepn. 6 C.M. Vesicovaginal fistula. Recovery.

(66) Fritz. Jan. 93. Sepn. 6-7 C.M. Tear of vestibule nearly through urethra. Recovery.

(67) Fritz. Feb. 93. Sepn. 5 C.M. Secondary haem., from atonic uteris . Recovery.

(68) Brown. 1893. Tear of vestibule to left of urethra. Recovery.

(69) Schauta. Nov. 92. Bleeding from corp., cav. clitorid. Recovery.

(70) Rep. by Woertz. Nov. 1892 Bleeding from atonic uterus. Recovery.

(71) Rep by Woertz. Feb. 1893. Tear of vestibule from clitoris to urethra. Tear in vagina. Resultant vesicovaginal fistula. Recovery.

(72) Rep. by Woertz. Feb. 1893. Tear in right corp. cav. clitorid. Recovery.

(73) Rep. by Woertz. March 1893. Death of septicaemia.

(74) ,Rep. by Woertz. April 94. Fever. Recovery.

(75) Schwartz. Feb. 94. Sepn. 7.5 C.M. Eclampsia. Bleeding from corp. cav. clit. Recovery.

(76) Braun. Death of Pyaemia.

(77) Koffer. Mar. 93. Pain in sacroiliac joints. Recovery.

(78) Braun. April, 93. Fistula in upper part of wound. Recovery.

(79) Koffer. April 93. Fistula, Bronchitis, Cystitis. Recovery.

(80) Braun. April, Bleeding from corp. cav. clitorid. Recovery.

(81) Koffer. April, 93. Bleeding from corp. cav. clitorid, and from varicose veins. Recovery.

(82) Braun. July. Tear of vagina. Fever. Recovery.

(83) Rep. by Büssemaker. Sep. 93. Bleeding from tear of cervix into peritoneum. Vesical fistule. Recovery.

(84) Binaud. 1895. Fistula left and nonunion. Recovery.

(85) Engstroem. Sep. 1894. Sepn. 3 C.M. Small abscess. Recovery.

(86) Binaud. 1895. Venous haem, and fistula. Recovery.

(87) Tissier. Jan. 1895. Haem., at opern. Prolapsus uteri and haem. Recovery.

(88) Rector. 1895. Cervical tear and rectocele. Recovery.

(89) Neschel. 1894. Sepn. 3 C.M. Septic Endometritis. Recovery.

(90) Lesin. 1895. Sepn. 6 C.M. Endometritis. Recovery.

(91) Lesin. 1895. Sepn. 5 C.M. Slight fever. Recovery.

(92) McCreery. Aug. 1896. Haemorrhage. Recovery.

(93) Lwoff, (Russia). 1895. Sepn. 5 C.M. Death of sepsis.

(94) Walter. Vesical fistula, due to pressure. Recovery.

(95) Davis. 1894. Sepn. 2 C.M. Septic thrombosis in femoral vein. Recovery.

(96) Goroschow. 1895. Sepn. 6-7 C.M. Copious venous haem. Recovery.

(97) Lambotte. May 95. Sepn. 7 C.M. Venous haem. Recovery.

(98) Jewett. 1895. Venous haem. Recovery.

(99) Smyly (Dublin) Complete tear of urethra and haem. Recovery.

(100) Smyly, (Dublin) Tear of cervix and urethra. Death of sepsis.

(101) Rep. by Arndt. 1896. Severe postpartum haem. 2 little fistulae. Recovery.

(102) Rep, by Arndt, 1896 Great postpartum haem. Recovery.

(103) Edgar. Wound went septic, bone necrosed. Recovery.

(104) Voiges. 1896. Fever. Recovery.

(105) Pozzoli. Mar. 94. Sepn. 4 C.M. Haem. from corp. cav. clitorid. Recovery.

(106) MissBalfour, (India). 1896 Sinus. Atrophy of right leg. Complete recovery.

(107) Buist. (Dundee) Phlebitis of varicose veins of leg. Recovery.

(108) Carr. Oct. 97. Sepn. 2 in. Sinus leading into urethra near neck of bladder. Phleg., Dolens. Recovery.

(109) Bengniés, (Paris). 1893. Haem., from wound and postpartum. Death of Sepsis.

(110) Branfoot. Sep. 1893. Sepn. 2½ ins. slight suppn. in wound. Temp. incontin. of urine. Recovery.

(111) Wheeler, (Boston) Sepn. 2¼in. venous haem. Phlebitis of left leg. Recovery.

(112) McDonnell. Dec. 1894. Free venous haem. Death in 24 hours of exhaustion(?) Haem(?)

(113) Williams, (Baltimore) Pus between wound and bladder. Death of Pulmonary Embolism.

(114) Lewers, (London). Feb. 1893. Suppn. of wound, necrosis of bone. Recovery.

(115) Pinard. May, 96. Death of Sepsis.

(116) Koffer. Death of Sepsis.

(117) Broomall. Death of Sepsis.

The above 117 cases include all those in the cases I could collect from the end of 1892, to the beginning of 1899, (about 310) which showed any complication or sequela.

Summary of complications and Sequelae in over 300 cases

Occurrence of such was in 117 cases

Lacerations.

1. Tears due to operation (in 30 cases)	Extension of operation wound to vulva vagina &c.	5 times
	Tear of vestibule alone	7 "
	" " labium minus	1 "
	" " ant. vaginal wall	9 "
	" " Urethra	3 "
	" " Bladder	0 "
	" " Vestibule, clitoris, and urethra (incomplete)	1 "
	" " " " " " (complete)	1 "
	" " " urethra and vagina	1 "
	" " " " " " and bladder	1 "
	" " " " " " cervix and perineum	1 "
	Lower uterine segment (left side) 1	1 "
2. Tears not connected with the operation (in 7 cases)	Cervix torn 4 times (once into peritoneum.)	
	Vagina torn from uterus	1 "
	Perineum ruptured	1 "

Sources of haemorrhage	Haemorrhage (in 38 cases.)	From operation wound	8
		From corpora cavernora clitoridis	9
		From vessels of bladder	2
		From varicose veins	1
		From venous sources	6
		From torn cervix	1
		In 3rd stage	3
		Postpartum haemorrage	8
Fistulae due to lacerations.	Fistulae due to lacerations.	Fistula, urethral	1
		" Vesicovaginal	3
		" Vsicouterine	3
Miscellaneous accidents.	Miscellaneous accidents.	Prolapsus uteri (at time of opn.)	1
		Cystitis	3
		Temporary incontinence of urine (not due to fistulae &c.)	4
		Rectocele(at time of opn.)	1
		Atrophy of right leg (temporary)	1

Localised sepsis.	Localised Sepsis.	Fever, unaccounted for and slight.	3
		Septic endometritis with recovery	2
		Local abscess in operation wound	9
		Fistulous tracks in operation wound (with necrosed bone 4)	10
Phlebitis.	Phlebitis.	Septic thrombosis of femoral vein	1.
		Phlegmasia dolens	1
		Varicose veins of leg (side not stated)	1
		Veins of left leg	5
Maternal Deaths.	Maternal deaths 35.	Septicaemia and Pyaemia	20
		Septic embolism of Pulmonary artery.	3
		(? septic) embolism of Pulmonary artery	1
		Haemorrhage	3
		Eclampsia	4
		Double pneumonia 1. hypostatic pneumonia 1 . Bronchiectasis &c.1	
		Intestinal obstruction unconnected with operation 1.	

A glance at the preceding summary establishes the truth of my contention that the chief danger lies round the symphysis pubis.

Tears connected with the operation occurred in 30 cases . Extension of the operation wound downwards so as to pass to the vulva vagina &c occurred in 5 cases. While in 5 other cases vestibular tears extended to the vagina, bladder, urethra &c. The vestibule alone (or Labium minus) was torn in 8 cases. Thus from this source 18 out of 30 tears arose.

The vagina alone in 9 and the urethra alone in 3 cases, were torn.

In no case was the bladder alone torn.

Most of the other complications and sequelae are from preventible sources. Thus mismanagement of the delivery resulted in 7 lacerations of the maternal passages, and in 7 fistulous tracks connecting organs.

Haemorrhage accounted for complications 38 times.

Local Sepsis accounted for 24.

Phlebitis accounted for 8.

Of 35 deaths Septicaemia, Pyaemia and septic sources accounted for 24 (about 70%) and Haemorrhage for 3 deaths. It may be noted that haemorrage from the operation wound alone never caused death.

(4). The limitation of the amount of pubic separation to 6 C.M. as a maximum, or at the very most (and not to be aimed at) to 7 C.M. is justified by a survey of these cases.

Out of all the cases where the amount of pubic separation is recorded (170 out of the 300) there were 6 with a pubic separation of over 7 C.M. These had respectively a separation of 7.5, 8, 8, 9, 10, and 12.5 C.M. The first two and the last have recorded an uncomplicated recovery. The third (8 C.M.) had a tear of the vestibule and died of sepsis. The fourth (9 C.M.) recovered, but a crack was heard during the separation, in the sacroiliac joint. The fifth (10 C.M.) had the urethra ruptured and died of haemorrhage from the operation wound and postpartum haemorrhage.

Over all the 170 cases the average maximum amount of pubic separation was 5.6 C.M. Over the 164 cases (excluding the above 6) the average maximum amount of pubic separation was 5.44 C.M. This corroborates my statement limiting the safe amount of pubic separation to 6 C.M.

CHAPTER III.

"What increase of pelvic diameters, the safe amount of pubic separation gives, and what constitutes a safe case for the operation."

Since the conjugata vera is the diameter whose actual or relative shortness bars the way to the foetus, and since enlargement of other diameters does not compensate for deficiency in the true conjugate, the principal interest is centred on that diameter.

Conjugata Vera.

Over all the cases the average length of the conjugata vera was 11.28 C.M. or 4.4 inches. It was measured from the centre of the sacral promontory to the posterior margin of the upper end of the symphysis pubis. In passing it is noteworthy of remark that only two out of all the 28 pelves selected at random had true conjugates of under 4 inches. All the rest were above 4 inches.

If Table A be examined it will be seen that in 26 cases, the average increase of the conjugata vera for each centimetre of pubic separation was 1.67 M.M.

Pubic Separation.	Increase in conjugata vera.
1 C.M. or .39in.	1.67 M.M. or .065in.
2 C.M. or .78in.	3.34 " " or .13 "
3 C.M. or 1.17in.	5.01 " " or .195 "
4.C.M. or 1.56in.	6.68 " " or .26 "
5 C.M. or 1.95in.	8.35 " " oor.325 "
6 C.M. or 2.34in.	10.02 " " or .39 "
7 C.M. or 2.73in.	11.69 " " or.455 "
8 C.M. or 3.12in.	13.36 " " or .520 "

This Table agrees in its results, very closely with other observors. Baudeloque in two experiments with a separation of the pubes of 2½in. got andincrease of the conjugata vera of 5½ lines or about 11.5 M.M., and 5 lines or over 10 M.M. respectively. He says:- a"I have observed nearly the same thing in all the "experiments I have made." He quotes others whose observations agree. Ripping with a separation of the pubes of one inch got an increase of 1½ lines or 3.3 M.M. in one case: in a second case with 1⅛in. of separation 1½ lines of increase: and in a third case with ½ an inch of separation an increase of 1½ lines in the conjugata vera. Serier with 3 inches of separation got 6 lines or 13 M.M. of increase.

Desgrange s with aseparation of 2 inches an increase of $6\frac{1}{2}$ or 7 lines.

The increase of the conjugata vera may be approximately stated as follows:-

Amount of Pubic Separation.	Increase of conjugata vera resulting therefrom.
1 C.M. or about $\frac{2}{5}$ ins.	1.67 M.M. or about $\frac{1}{25}$ inch
2 C.M. or " $\frac{4}{5}$ ins.	3.34 M.M. " " $\frac{1}{10}$ inch
3 C.M. or " $1\frac{1}{10}$ ins	5 M.M. " " $\frac{1}{5}$ inch
4 C.M. or " $1\frac{1}{2}$ ins.	6.6M.M. " " $\frac{1}{4}$ inch.
5 C.M. or " 2ins.	8.5 M.M. " " $\frac{1}{3}$ inch
6 C.M. or " $2\frac{1}{3}$ ins	1 C.M. " " $\frac{3}{8}$ inch
7 C.M. or " $2\frac{5}{8}$ ins.	1.18 C.M. " under $\frac{1}{2}$ inch
8 C.M. or " 3ins.	1.3 C.M. " over $\frac{1}{2}$ inch

It will be of interest to examine the cases a little more in detail

as in Table below:-

In 28 Cases.

No. of Cases	Length of Conjugata vera.	Average increase for each C.M. of pubic separation.
1	14.5 C.M.	1.66 M.M.
1	13.9 C.M.	2.8 M.M.
3	12.5 C.M. to under 13 C.M.	2.0 M.M.
4	12 C.M. " " 12.5 C.M.	1.8 M.M.
2	11.5 C.M. " " 12 C.M.	1.0 M.M. (1 case)
5	11 C.M. " " 11.5 C.M.	1.7 M.M.(4 cases)
5	10.5 C.M. " " 11 C.M.	1.46 M.M.
5	10 C.M. " " 10.5 C.M.	1.65 M.M.
1	9 C.M. " " 9.5 C.M.	1.14 M.M.
1	8.6 C.M.	1.14 M.M.

The increase of the true conjugate is less the smaller the conjugate.

By examining the preceding table it will be seen that (leaving out of account the pelves with diameters of 14.5 C.M. and 11.5 C.M. respectively) the larger the conjugata vera is, the greater the amount of increase of this diameter for each centimetre of pubic separation. Thus a pelvis with a conjugata vera of 13.9 C.M. has an average increase of 2.8 M.M., with one of 12.5 C.M. to 13 C.M. an average increase of 2 M.M., and

so on, the smaller the conjugata vera the less the increase of it by separating the pubes. V. Cocq states that for each centimetre of separation, the conjugata vera increases on an average by 2.5 M.M. This is only true for large pelves.)

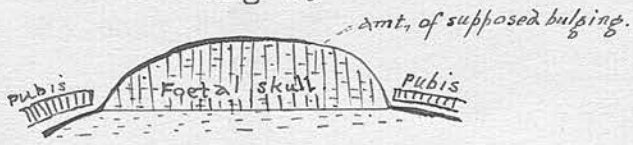
Bulging of foetal head does not assist.

The principal interest, as I have said lies in the increase of the true conjugate. It is usually stated that the gain in the conjugata vera by the separation of the pubes is augmented by the bulging of the foetal head through the interval between the separated pubes. This is not so, and the increase of the conjugata vera stated in the text (1.67 M.M. for each C.M. of pubic separation) is all that we can hope to obtain by pubic separation, and includes all the bulging that can occur.

The foetal skull is a hard structure moulded by pressure into the circular shape of the pelvic brim. Therefore when the pubes are separated, the head again moulds itself to the shape of the brim. This shape of the brim is deficient at the gap between the pubes; and the foetal head merely bridges across this gap continuing in its outline the general curve given to it

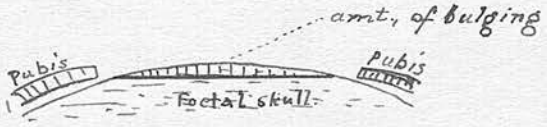
by the pelvic brim. It does not bulge forward between the bones so that the bulging part has a circular outline of acuter curve than the rest of the foetal skull, (See Fig. I.)

Fig I.



It cannot do so, because its bones are hard and to some degree osseous, and also if it did the bladder anterior vaginal wall &c., would protrude between the bones, (a rare but occasional accident). All that occurs is the approximation and over-riding of the bones: and the portion of foetal skull at the gap between the pubes only bulges just so much as is due to the curve impressed on it by the moulding of the brim continued from the rest of the skull. (See Fig. 2)

Fig. 2.



Now my measurements were made from the centre of the sacral promontory to a point equidistant between the upper ends of the separated pubes, and on the circumference of the circle formed by the curve of the brim. Consequently this measure includes all the gain got by the only kind of bulging of the foetal head that can occur.

The necessity of making this point a point for measurement existed in the fact that measurement could be made to no other point, as if it were made to the pubic spines, the very fact of their separation would add increasingly to a measurement from the sacral promontory to them.

Diagonal Conjugate. Table F.

The diagonal conjugate extends between the centre of the sacral promontory and the lower end of the symphysis pubis. During separation of the pubes, it was measured to a point mid-way between their lower ends. In my cases which had conjugata vera of 4.4 inches, it averaged 5.1 inches.

In 16 cases with a diagonal conjugata of 12- (under) 14 C.M. the average increase per C.M. of pubic separation was very nearly 2 M.M. The average increase over all the cases was 1.8 M.M.

Intertrochanteric diameter. Table H.

The Intertrochanteric diameter extends between the most prominent points on the outer surface of the great trochanters. In my cases it averaged nearly 29 C.M. or 11½ inches. Its average increase per C.M. of pubic separation was very little over 6 M.M.

Intercristal or Bisiliac diameter. Table J.

The intercristal diameter extends between the two most distant points in the same transverse plane, on the summits of the iliac crests. In 25 cases it averaged 10 inches (10.12 inches). The average increase per C.M. of pubic separation was 2.4 M.M.

The Interspinous diameter. Table K.

The interspinous diameter extending between the two most anterior points on the anterior superior iliac spines, averaged 8.8 inches in my cases, and the average increase per C.M. of pubic separation was 5.61 M.M.

As I shall show, the increase of this diameter and of the bisiliac diameter is slightly minimised by the erection of the iliac crests due to rotation of the ossa innominata on their long axis.

Transverse diameter of Brim. Table L.

The transverse diameter of the brim extends between the two most distant points in the same transverse plane, on the iliopectineal lines. It averaged 5.13 inches,

and had an average increase of 4.01 M.M. per C.M. of pubic separation; or $\frac{2}{5}$ of the total amount of separation.

Right oblique diameter of brim. Table N.

The right oblique diameter of the brim extends from the right sacroiliac joint to a point on the left side of the pelvic brim opposite the iliopectineal eminence of that side. It averaged 5 inches in my cases. The average increase per C.M. of separation of the pubes was 3.84 M.M.

Left oblique diameter of Brim. Table O.

The left oblique diameter of the brim extends from the left sacroiliac joint to a point on the right side of the pelvic brim opposite the iliopectineal eminence of that side. It averaged 4.94 inches or 12.56 C.M. and increased by an average of 3.9 M.M. per C.M. of pubic separation.

Thus it will be seen that with the Intercristal increasing 2.4 M.M.,the Interspinous 5.6 M.M., the Transverse 4 M.M., the right oblique 3.8 M.M., and the left oblique 3.9 M.M., per C.M. of pubic separation a very small amount of pubic separation will suffice to give sufficient enlargement of these diameters for the foetal head to pass. But, in the more important forms

of pelvic deformity these diameters are often enlarged, at any rate relatively if not actually. A separation of the pubes of 6 C.M. would increase the diameters by 1.5 C.M., 3.4 C.M., 2.4 C.M., 2.3 C.M., and 2.3 C.M. respectively, an amount very much more than sufficient for most cases.

On the other hand the conjugata vera which most often is the difficult diameter for the foetal head, only increases on an average 1.67 M.M. per C.M. of pubic separation; or with 6 C.M. of pubic separation 1 C.M. or $\frac{2}{5}$ of an inch. So that it is evident we will need all the separation we can safely get in most cases, to get sufficient increase.

What length of Conjugata Vera constitutes other points being satisfactory, a suitable case for symphysiotomy.

We are therefore now in a position, knowing what amount of pubic separation is safe and what increase of conjugata vera that gives, to state to what degree of contraction in the true conjugata we should confine the operation.

Doederlein agrees with me in saying that above 6 C.M. of pubic separation, the tissues are apt to tear. This amount of pubic separation gives an average increase of the true conjugata of 1 C.M. or about $\frac{2}{5}$ of an inch.

In Symphysiotomy we consider both mother and child, and we resort to it in a certain case, because we are unable to deliver a living child except by caesarean section: but caesarean section being so dangerous to the mother we are unwilling to perform it. Thus Symphysiotomy aims at the recovery of both mother and child. Therefore in performing it we must avoid anything that adds to its risk.

(1) Conjugata vera must be $2\frac{7}{8}$ inches or over, but under $3\frac{1}{4}$in.

(1). Since $\frac{2}{5}$in., is all that we should hope to add to the true conjugate, the cases must be strictly limited to such cases as by the addition of $\frac{2}{5}$in., to the true conjugate, can be delivered by nature alone, or by forceps or by version.

But here again a limitation must beset. The primary object of symphysiotomy is to deliver a living child, and we know that version itself even in a fairly normal pelvis, by bringing about a breech presentation endangers the life of the child to a considerable degree. Much more so then, will it endanger its life after symphysiotomy where the medical man's anxious attention is given to the mother, and where she has probably already been a long time in labour and the uterus is contracted. So that although we may sever the symphysis when it

is very desirous to save a living child and we don't want to run the risk of caesarean section, and the use of symphysiotomy will only bring version within our power; yet it is desirable to limit the cases to those in which, if not nature, at any rate forceps will subsequently deliver the child. Now it is laid down for the guidance of practitioners that forceps are applicable when the conjugata vera is 4 to $3\frac{1}{4}$ inches, and that version may be used when it is as short as 3 inches.

We shall therefore limit our cases to such as with a separation of the pubes of 6 C.M. as a maximum, will have their conjugata vera so increased as to raise it to $3\frac{1}{4}$ inches at the very least. If we subtract $\frac{2}{5}$in. from $3\frac{1}{4}$in., we get as a result $2\frac{7}{8}$in., or 7.3 centimetres. Therefore Symphysiotomy should never be performed unless there is a conjugata vera of at least $2\frac{7}{8}$ inches.

(2) Child must be alive.

(2) The foetus must be living.

Thus we have got the data to tell us what is a suitable case. Symphysiotomy may be done when the conjugata vera is longer than $2\frac{7}{8}$in., but at $3\frac{1}{4}$in., it comes into competition with forceps.

Rule to follow.

A safe rule is that a case in which forceps have been tried and are unavailing, is suitable for symphysiotomy, (1) if the conjugata vera is $2\frac{7}{8}$in., or over that and (2) if the child is alive.

Corroboration of the fact that $2\frac{7}{8}$in., is the correct minimum of true conjugate.

That this is the minimum conjugate with which we should do the operation, is abundantly evident if we go over the literature.. Thus in 1778 Sigault delivered a woman by symphysiotomy with a conjugate of only $1\frac{11}{12}$inch. She died of her pelvic injuries. The following cases also died of their pelvic injuries:- Du Chauffoy's of Lyons, in 1781, with a conjugate of $1\frac{7}{12}$in., the first case done in Britain by Welchman, in 1782, with a conjugate of $2\frac{1}{4}$in.; De Matthüs'case with a conjugate of $2\frac{1}{2}$in.; Leroy's case with a conjugate of $2\frac{1}{2}$in., De Cambron's case with a conjugate of $2\frac{7}{12}$in., Galbiatis (1815) with one of $2\frac{1}{5}$in., Viola's (1869) with one of $2\frac{5}{8}$in., Tarallo's (1869) with one of $2\frac{7}{8}$in., Finizio's (1877) with one of $2\frac{5}{8}$in. These all went the same way, dying of pelvic injuries, of gangrene of the soft parts and so on. On the contrary, even in olden times, many, or rather most cases with true conjugates of only $2\frac{7}{8}$in., recovered. Finally Morisani states that there is not much scope for the operation with a conjugata vera below 7 C.M.

CHAPTER IV.

"The movements of the innominate bones during pubic separation, and their practical bearing."

At first sight it would seem as if the necessity for this chapter did not exist. The outward movement of the innominate bones during the separation of the pubes is so evident, is so palpably dangerous to the tissues that it would seem to be the only important movement that could take place. This is not so. Far from it. For I hold that not only is it an unnatural, artificial and forced movement, but it is a most dangerous one (as is seen from Chapter II.) It should be rendered, so far as it is possible, subsidiary to a second, natural, unartificial and spontaneous movement.

These two movements are:-

(I) Movement of the pubes outwards by rotation of the innominate bones on a vertical axis passing through the sacroiliac joint.

(II) Movement of the pubes downwards by rotation of the innominate bones on a horizontal (transverse) axis passing through the sacrum. This is the hitherto unappreciated movement in symphysiotomy, which isnatural, spontaneous, and indissoluble from the outward movement; and is of great assistance to

us in our obtaining sufficient increase of the diameters of the brim with asafe amount of separation, for two reasons: (1) that it contributes to the safety of the pubic separation: (2) that it contributes to the increase of the diameter of the inlet.

(III.) A third movement also exists which is dependent upon the other two movements and is a rotation of the innominate bone on its long axis so that the ilia become more erect.

(I) The first movement, that of the innominate bones outward so as to carry the pubes apart, is self evident. It causes the iliopectineal lines to form segments of a larger circle, so that necessarily the diameter is increased. But as the pubes and sacrum are flattened (the brim being an ellipse) and the movement really occurs on the sacroiliac joint as centre and from that to the iliopectineal eminence as radius, the enlargement is really in the transverse and oblique diameters as I have proved by actual measurement, (see p.54) and not nearly or anything like nearly so much in the anteroposterior diameter of the brim.

(II) The second movement, that of the pubes downwards, was first indicated by Wehle, who in experiments on symphysiotomy excised a pelvis, hung it up and suspended weights from the pubes. Then on division of the symphysis, an outward and downward movement of the pubes took place. In any case this was an unreliable experiment: for the eye might be deceived, and the movement downwards might be ascribed to the weights. In any case Wehle did not ascribe to it the real significance that it possesses as he said it increases the diameters obliquely. This is not at all its true function.

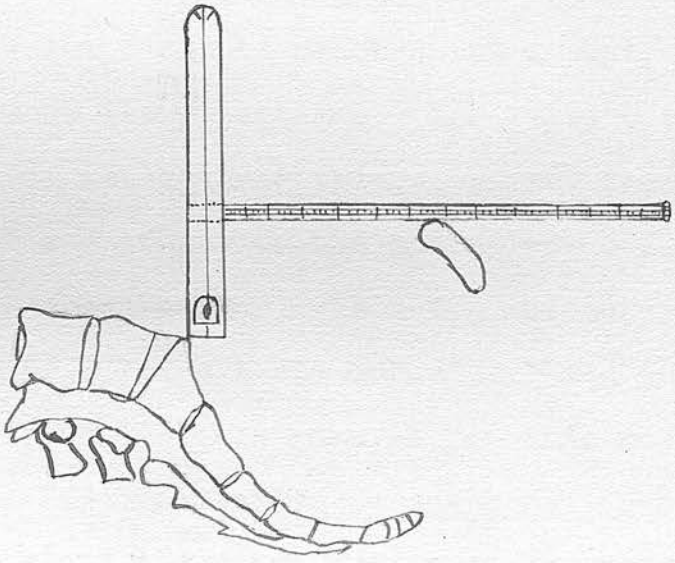
Dimante (Répetoire univ. d'obst. et de Gyn. 1894) stated that in the cadaver when the pubic bones are pressed apart the sacrum rotates on its transverse axis so that its promontory swings backwards and its apex forwards. He could only see in this "an objection to symphysiotomy on mechanical grounds," saying that thus the anteroposterior pelvic diameter was diminished more and more from above downwards.

While still ignorant of the statements of these observers, it occurred to me that it would be an important thing to measure the vertical height of the sacral promontory above the upper margin of the pubic bones,

first of all in the natural state, and then with various amounts of separation of the pubes.

To do this I obtained a plumb rule, and a box-wood, carpenter's measure graduated in millimetres. One edge of the plumb-rule was placed vertically on the centre of the sacral promontory; and then the carpenter's rule was placed with its one end parallel to and against this edge of the plumb-rule, so that its length was at right angles to this edge of the plumb rule and rested on the symphysis pubis.

Fig. 3.



In this way the vertical height of the sacral promontory could be read off from time to time. I used the centre of the sacral promontory and the centre of the posterior edge of the upper end of the symphysis pubis

as the two points. When the pubes were separated I used a point equidistant between the upper margins of the posterior aspects of the separated pubes.

In every case I found that the vertical height of the sacral promontory over the symphysis pubis increased with every increase in the amount of separation of the pubic bones from one another.

Thus if, as I thought I could at the time, I cannot lay claim to have been the first to indicate this combination of a downward with an outward movement of the pubes; nevertheless I can claim to be the first to prove its existence by a mathematical demonstration of its occurrence, the first to measure its amount, and the first to show its importance. For Wehle's experiment did none of these three things, while Dimante actually called it a drawback to the operation.

I shall later show that my reason for introducing this chapter after those on"safety" and on "utility" of the operation, was good. For this movement not only is a great factor in safe separation of the pubes, but is a still greater one in contributing towards thatincrease of the true conjugate that the operation really aims at.

But first of all let us have the mathematical

demonstration of its occurrence. Table B. shows the vertical height of the sacral promontory above the symphysis pubis in each case, and the amount of increase of that height with each increment of pubic separation (where time allowed of its being done with each increment and not only with the full amount of pubic separation attained in the individual case.)

No. of cases.	with a pubic separation of	Increase of vertical height of sacral prom.	
		Mean	Average
in 10	1 C.M.	2.5 M.M.	3.2 M.M.
" 11	2 C.M.	5.0 M.M.	5.2 M.M.
" 10	3 C.M.	6.5 M.M.	7.6 M.M.
" 10	4 C.M.	7.5 M.M.	8.85 M.M.
" 7	5 C.M.	9.0 M.M.	9.2 M.M.
" 3	6 C.M.	13.0 M.M.	13.0 M.M.
" 6	7 C.M.	7.5 M.M.	9.6 M.M.
" 8	8 C.M.	9.5 M.M.	8.6 M.M.

As all were not measured with each increment of pubic separation, the number of cases to take the average over differs for each amount of separation.

In 23 cases the mean of increase of height of the sacral promontory above the symphysis pubis for each

centimetre of pubic separation was 1.4 M.M. (average was 1.64 M.M.) Thus with a separation of 6 C.M. the depression of the symphysis pubis is about 8.5 M.M. below its original horizontal level, (calculating from average would be nearly 1 C.M.)

Proof positive of downward movement.

This then is proof positive thatwhile the pubic bones were increasing their distance from one another they were also becoming depressed below their original horizontal level. With each separation of the pubes there is a corresponding depression of the pubes of 1.4 M.M.

Corroborative evidence of the downward movement.

Besides these measurements, certain facts corroborate the downward movement of the pubes.

The lateral margin of the base of the sacrum (at the upper edge of the auricular surface) as I have stated, although at first flush with the corresponding border of the innominate bone, with each increase in pubic separation, increasingly projects above the level of the innominate; so that the salient angle of the sacral becomes much elevated above the horizontal level of the salient angle of the iliac auricular surface. (See Drawing V.)

Again the separation of the sacral from the iliac articular surface is always greatest between the salient angles of the auricular surfaces, much greater than below that or posterosuperiorly to that point. (See Drawing V.)

I have indicated the opinions of Zaglas, Duncan, Wood, Cazeau, Walcher, Klein Pinzani and others as to the occurrence of downward movement of the pubes without separation.

When I have excised the sacroiliac joint after the pubes have been separated to 6, 7, or 8 C.M. I have found that while the outward separation of the joint surfaces was still difficult and limited anteriorly, the iliac portion could with ease be rotated on the sacral, giving the posterior ligament, a slightly spiral twist in a downward direction.

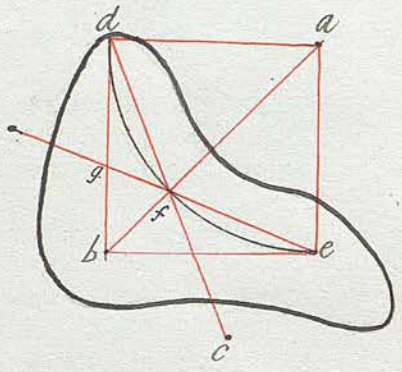
Wehle and Dimante have both experimentally proved the existence of this movement, as I have before said.

How downward movement is favoured.

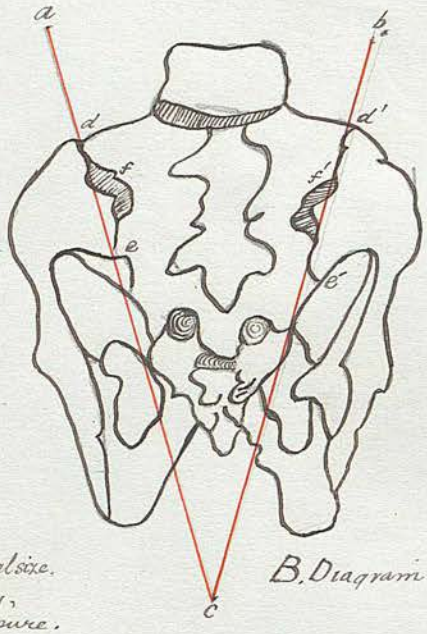
Reference to the construction of the sacroiliac joint will show how this downward movement of the pubes in symphysiotomy is not only favoured, but compelled by Nature to combine with the outward movement; while upward movement of the pubes (except as a recovery of its previous position) is absolutely prevented.

Drawing VI.

A.



B.



A. Diagram of sacral auricular facet. natural size. placed as in erect posture of the body, with lines of tension and pressure.

a = centre of action of posterior deep ligaments.

dfe = arc of sacral groove forming quadrant with the lines of tension ad, ae.

de = chord of arc.

df, ef = chords of semi-arc.

dge = sacrovertebral angle.

dbe = triangle forming sacral "cuneus"

b, e } position of sacral "joggles"

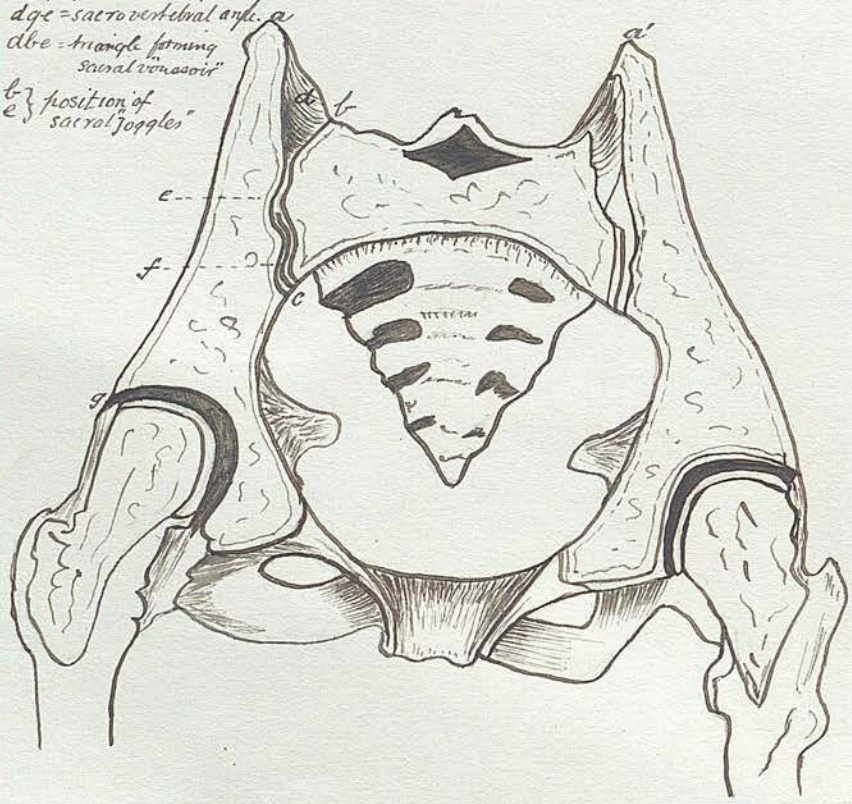
B. Diagram of a transverse section of the pelvis in the line of the sacro-laxis - Poster

acb = angle of vertical sacral m

de = depth of sacroiliac articula

f = interosseous sacroiliac liga

C.



C. Section of the pelvis and heads of the thigh bones made in the direction of the sacrocotyloid arch, a little below the pelvic brim. (after Wood - Todd's Cyclopaedia of Anat. & Phys.).

It shows (a) antero-posterior sacral wedge
(a) suspending office and oblique direction of the posterior sacroiliac ligaments.
(b) the wavy section of the joint

a. iliac tuberosities. bc anteroposterior sacral wedge. d. deep post. sacroiliac ligament.
ge. sacrocotyloid rib. e. interosseous ligament. f auricular groove - c. sacral joggle.

1. By shape of articular surfaces and of sacrum.

(1) First of all the shape of the two articular surfaces and of the sacrum as a whole, favours it.

The joint is composed of the articular surfaces of the sacrum and ilium: each, as I have said, consisting of an anteroinferior portion, or auricular surface covered with the auricular cartilage; and of a posterosuperior portion roughened for ligamentous attachment.

Iliac auricular surface.

The iliac auricular surface corresponds in shape with the sacral. It is (1) bevilled off at the salient angle formed by the junction of its vertical and horizontal limbs: and also at the posterior end of the horizontal limb (Drawing VI. Fig. A.)

(2) More or less well developed on the inferior limb is a distinct elevation sometimes an elongated rounded ridge, extending along the auricular area, and following the curve of the auricular surface (see photograph at beginning of volume.)

Sacral auricular area.

The sacral auricular surface shows (1) projections at its salient angle and at the posterior end of the horizontal limb which fit on the bevilled off iliac areas described on the iliac auricular surface. (See Drawing VI. Fig. C.C.)

(2) Running along the length of the sacral auricular surface, along the centre of both limbs, is a more or less well developed, elongated, depression. (well brought out in the photograph of a portion of a sacrum at beginning) which forms the arc (Drawing VI. Fig. A. d.f.e.) of acircle whose centre (Dr. VI. Fig. A. a.) is at the centre of action of the posterior ligaments of the sacroiliac joint. Consequently this arc is apart of a circle whose centre is a point coincident with the centre on which downward movement of the innominate bone on the sacrum occurs (see page 16). This groove, just as the sacral projections cover the iliac bevils, receives the corresponding prominence on the iliac auricular surface.

Thus, as it were, a groove and slot arrangement is provided on the joint surfaces, for rotation upwards and downwards,with a circular sweep, of the innominate on the sacral bone.

The Sacral wedges.

The sacrum itself is wedge-shaped in three directions. (1) Looked at from its anterior aspect it is wedge-shaped, the base of the wedge being at the alae and promintory where the sacrum is broadest.

From this downwards, the breadth narrows gradually, the lateral margins converge, till the apex of the wedge is reached at the coccyx. (2) Looked at from above, it is wedge-shaped. The posterior surfaces of the sacrum is narrower than the anterior by about half an inch. So that horizontal transverse section of the sacrum at its upper part, is wedge-shaped, with the narrower end of the wedge posteriorly.

Fig 4.

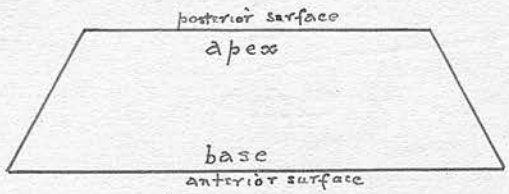
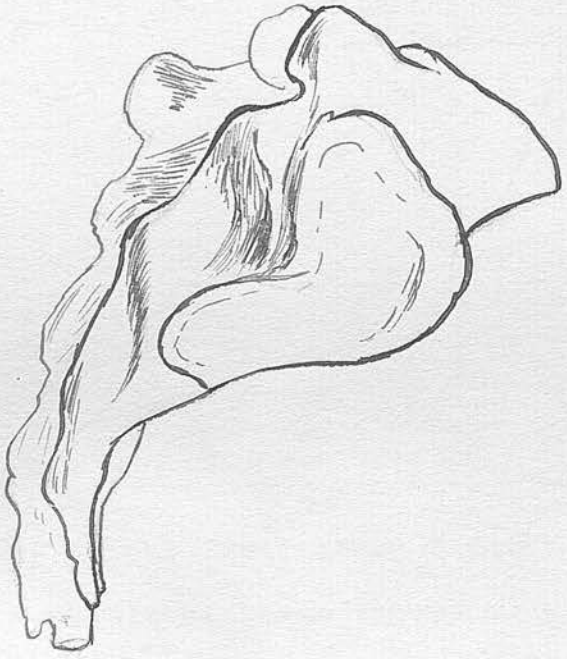


diagram of second sacral wedge.

This is due (1) to the bevilling off of the lateral surfaces posteriorly, which is necessary for the lodgement and attachment of the interosseous ligaments, (2) to the pointed projections, before described, at the salient angles of the sacral auricular areas which fit on to the bevilled off salient iliac auricular angles.

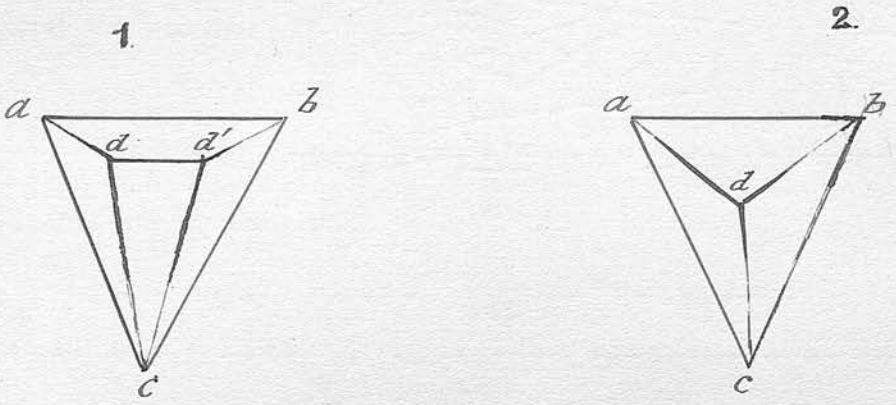
(3) Finally, if looked at sidewise, the lateral masses of the sacrum are seen to be wedge-shaped, the sacrum being thicker above than below; so that, superiorly, the anterior and posterior surfaces are widely separated, but are approximated to one another as the apex of the bone is reached. (See Drawing VI. Fig A.) and below.



Side view of Sacrum
Showing wedge.

In consequence of these wedges, if we imagine the thickness of the sacrum progressively increased, while still proportionately maintaining its wedge-shape, until the posterior surface became progressively narrowed away to nothing; the result would be a conical, three sided, triangular body, with the anterior aspect of the sacrum as its base. (See Fig 5.2. Below.)

Fig. 5



From this product of the imagination (Fig 5.2. above) we see that as a result of these sacral wedges, its auricular area faces as it would face, if it were the side (a d c or b d c) of such a triangular body, and thus looks outwards, downwards and backwards, and slopes from above downwards, and from before backwards

and to the middle line posteriorly.

The iliac auricular surface, in the natural position of the bone, faces and slopes in exactly the oppodirection, looking inwards, upwards and forwards, and sloping from below upwards, and from behind forwards and outwards.

Thus the sacral auricular area as it were, overhangs the iliac and prevents its movement upwards forwards and inwards, while it allows it downwards and outwards.

II. The arrangement of the liga-ments favours downward movement.

II. The arrangement of the ligaments favours this downward movement.

The superior and anterior sacroiliac ligaments, thin and feeble, offer little resistance to movement.

The posterior ligament binds the bones firmly and immovably together posteriorly and forms a centre for the rotatory movement of the ilium on the sacrum.

The greater and lesser sacrosciatic ligaments, extending between the sacrum and the coccyx, prevent these bonesfrom increasing their distance from the ischium; that is the same as to say the pubes also from doing so, thus preventing the rotatory movement of the innominate bone on the sacrum so that the

pubes move upwards.

How these act to favour downward movement of the pubes.

(1) Movement directly outwards does not occur.

When force is applied to the pubic bones to separate them, they cannot move directly outwards. To do this the anterior portion of the joint would have to open up equally both above and below. But the very strong sacrosciatic ligaments prevent this; and as a matter of fact, even where the separating force, such as is applied when the thighs are bent upon the abdomen and used as lever to force the pubes outwards, is so unnatural as to act directly outwards, separation does not occur equally all along the anterior line of the joint; but as I have proved by experiment many times, isalways greater at the salient angles of the auricular surfaces, than either above or below that point.

(2) Movement upward prevented.

The iliac bones cannot rotate on the sacrum so as to elevate the pubes (unless the pubes have been previously depressed, and this upward movement occurs merely as arecovery of its former position) (1) because the salient angle of the sacral auricular surface, projecting outwards and causing the increased breadth of the sacrum anteriorly, fits over the bevilled off area on the salient angle of the iliac auricular

surface; and thatbevilled area on the salient angle of the iliac auricular area ends below in a raised edge, "causing the sacrum to bite on the iliac here "to a considerable extent, forming what is called in "engineering nomenclature a 'joggle' to the sacral " 'voussoir' ".

(2) Not only so, but the two sacrosciatic ligaments prevent the ischium from increasing its distance from the sacrum, and so resist this rotation of the innominate bone on the sacrum so as to elevate the pubes.

(3) Movement downwards is favoured

In the parturient condition however, no such unnatural force acting directly outwards should be applied. After the division of thesymphysis pubis, the force applied is that of the uterus and accessory muscles acting through the foetal head. The direction of thisforce is downwards, and also outwards (with regard to the pubes) by the distending action of the relatively large head on the relatively small pelvic brim, as it endeavours to pass through it. Thus in parturition, the force acting on the pubes is downwards and outwards.

When section of the symphysis is performed, (1) theposterior sacroiliac ligament binding the bones

together posteriorly, forms a centre or pivot on which rotation of the osinnominatum on the sacrum may occur: (2) the sacrosciatic ligaments do not resist the approximation of the ischium and coccyx that must result from the movement of the pubes downwards: (3) the direction of the auricular surfaces favours the rotation of the osinnominatum on the sacrum with movement of the pubes downwards: (4) the joggle or bite formed by the lower edge of the bevilled off area at the salient angle of the iliac auricular surface to the voussoir or arch-stone formed by the projecting salient angle of the sacral auricular area, is unlocked by, and does not hinder, movement of the pubes downwards by rotation of the innominate bones on the sacrum: (5) and lastly, the prominence present on the iliac auricular surface sliding in the elongated groove (in the sacral auricular surface) which curves so as to form the arc of a circle whose centre is at the centre of action of the posterior sacroiliac ligaments, isalmost, if not actually, a provision of nature for such a rotation of the innominate bone on a transverse axis passing through the second piece of the sacrum, as will carry the pubes downwards.

Nature favours this movement (1) for increased safety. (2) for the increment of the conjugata vera, it gives.

We have seen that, besides knowing how much increase of the conjugata vera, each centimetre of pubic separation will produce, we must know what degree of pubic separation is safe. For it is safety we aim at.

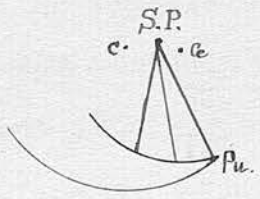
It renders the operation of Symphysiotomy as safe as possible, that this downward movement of the pubes is favoured by nature, and it must also be favoured by the operator.

I have stated much experimental proof of the fact that in the natural condition of the pelvis, rotation of the osinnominatum on the sacrum so as to depress the pubes can occur; and this isequivalent to arelative drawing upwards and backwards of the sacral promontory. It is stated that by this the conjugata vera is increased as much as one or two lines. In difficult labours during the first stage, the patient is often placed in Walcher's position, so that by the weight of the limbs drawing on the pubes, the pubes are depressed and the conjugata vera increased.

Now in the natural state this is necessarily so provided that the sacral promintory can be proved to increase its vertical height above the symphysis. It is easy to conceive that rotation of the pubes on a centre not at the promontory might easily carry them

nearer and not further from the promontory. A simple figure will show this.

Fig. 6.



If S.P. in the sacral promontory and Pu the Pubes it isobvious that were the Pubes to rotate on the centre Ce then every downward movement would bring them nearer the Sacral Promontory and would lessen the conjugate. But as the pubes rotate on a centre C. posterior to the promontory and further than it from the pubes every downward movement of the pubes carries them further from the promontory. What has been done hitherto has been merely to measure the conjugata vera in the ordinary horizontal position or with the thighs bent upon abdomen, and then to measure it with them in the extended position. As there was an increase

of the conjugate it was accepted that this increased the conjugatavera. Now in my experiments, what was done was to measure the vertical height of the sacral promontory above the symphysis pubis and then again with each access of pubic separation so far as time allowed. In this way it was possible not only to demonstrate the downward movement of the pubes but also to measure its amount and finally to apportion by a simple plan upon paper, the amount of increase due to the descent and to the separation of the pubes respectively.

It being therefore proved that descent of the pubes in Symphysiotomy increases the conjugata vera, a simple algebraical expression will show that the increase must be got with greater safety.

Let A. equal the increase of the conjugata vera due to separation of the pubes in a purely outward direction to a definite amount . B. represents the amount of increase due to descent of the pubes alone without separation. Then (A+B) must be larger than A.

Therefore by combining a downward with an outward movement of the pubes we will get a required increase of the conjugata vera for a less amount of pubic separation

than by simple outward movement alone.

It is self evident that the larger the amount of separation of the pubes, the greater the damage to the tissues. Since the combined movement gives us our required increase with less of this separation, then it must be safer.

The principal value of the pubic section.

Not only so but I shall show later on that in many cases the descent of the pubes accounts for more of the increase of the conjugata vera than does the outward movement and thatin fact the principal value of symphysiotomy with its section of the union between the pubes consists in the fact that there can then be brought about amuch greater depression of the pubic bones than can be accomplished when they are united. This we will deal with later.

Another important result of the downward movement is that there is less likelihood of the vessels and nerves passing across the front of the joint being injured. For they pass in front of the sacroiliac joint at right angles to its line, and so the rotatory movement throws the strain across them, and not along their length as the outward movement will tend to do.

The combined outward and downward movement occurs

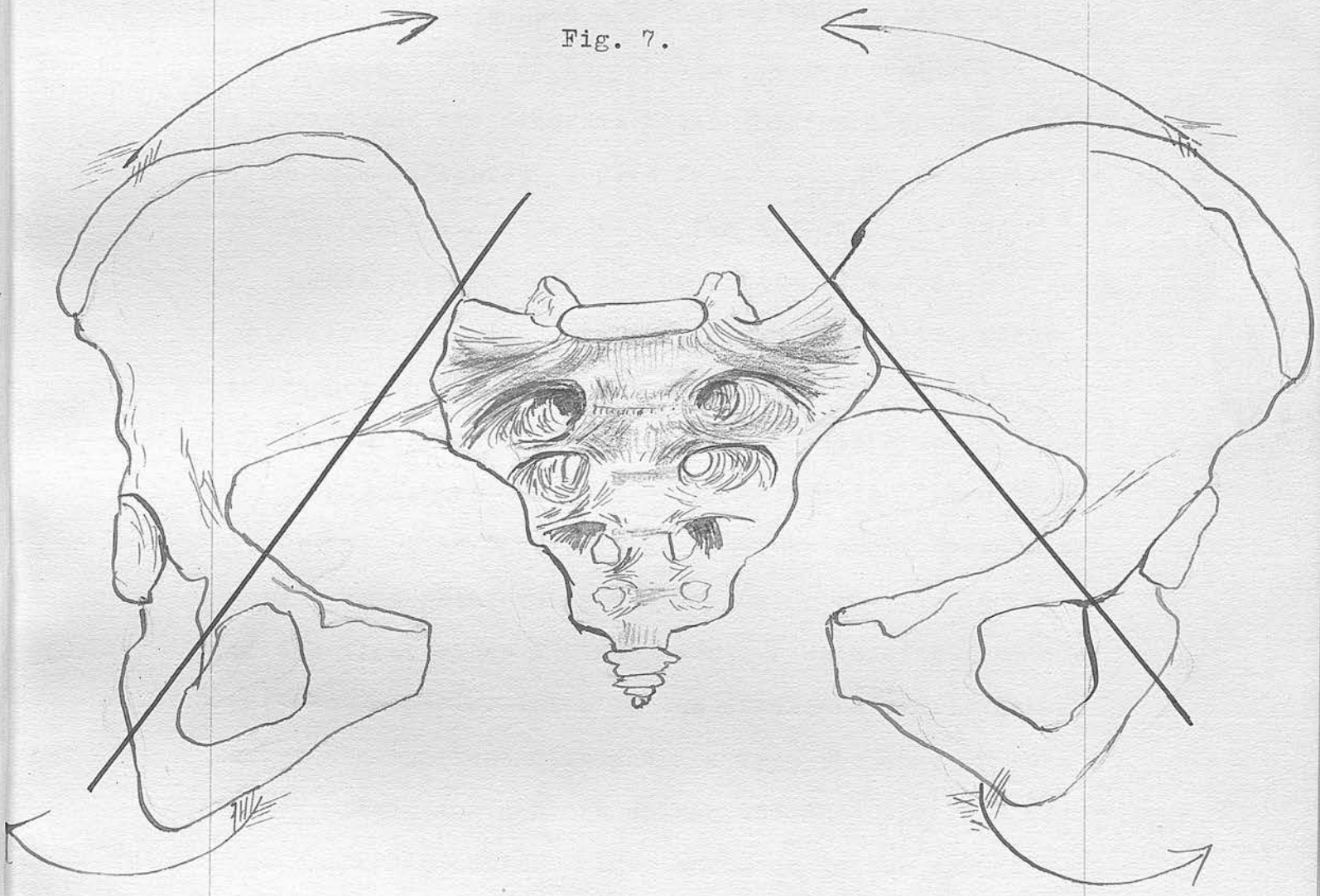
in the nonpregnant pelvis when the pubes are divided and separated. The downward movement will much more tend to occur during labour, where, in the first stage (especially in such cases as will require symphysiotomy) the foetal head infringes on the pubes and presses them down. Moreover, we can, and should, assist this depression of the pubes by placing the patient in Walcher's position; but only in exceptional cases, should we allow the weight of the limbs to exert outward traction on the pubic bones.

III. Rotation of innominate bone on its long axis.

III. Besides the rotation of the osinnominatum on the sacrum I on a vertical and II on a transverse horizontal axis so as to carry the pubes outward and downward, a third movement exists which has never been hitherto described . This movement consists in rotation of the os innominatum on its own long axis (an axis say from the posterior superior spine to the iliopectineal eminence) so as to cause the ilia to become more erect. That is to say, as the pubes pass downward and outward, the tubera ischii, relatively to the rest of the bone, are carried further apart, the iliac crests relatively to the rest of the bone, approximate to one another. The innominate bone, as it were, revolves round its own axis, the upper part

moving inwards towards the middle line, the lower part revolving outwards. (See Fig. 7. below.)

Fig. 7.



In my Gunning Victoria Jubilee Prize thesis I mentioned this movement but discredited it because of calculations made upon drawings of the outline of the pelvis. However I have come to see that these outlines and the diagrams based thereon although made from actual figures copied from books are not reliable as they were not intended by the author to be exact.

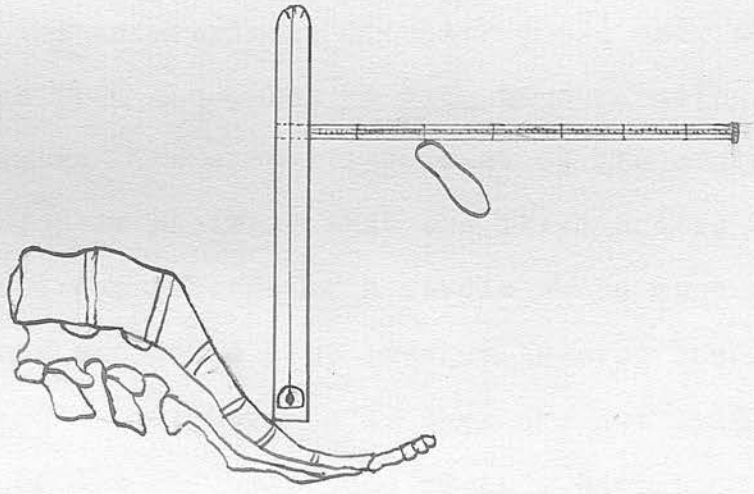
This movement of the innominate bone does actually exist, and owes its origin to the two first movements in a way I shall explain later. But first I shall give the proof of its existence.

The columns in my cases marked "Height" and "Vertical Height of Interspinous diameter above Symphysis pubis" were obtained in the following way:- In 18 of the first cases I placed a ruler extending from one anterior superior spine to the other and simply measured the shortest distance between the edge of this ruler placed against the spines and the upper end of the symphysis pubis. This was done in the natural condition and repeated after each degree, or a certain degree, of pubic separation. The results of this are given in Table D.A.

It was invariably found that with each increment of separation, the distance between the interspinous

diameter and the horizontal level of the symphysis pubis increased. In 5 cases (Table D.B.) I took the vertical height of this interspinous diameter (marked out by the ruler placed on the anterior superior spines) by means of the plumb rule, which I held vertically in the site of the interspinous diameter; and then by the measure placed with its end parallel to the edge of the plumb rule apposed to the interspinous diameter I gotthe true vertical height of the interspinous diameter above the symphysis pubis.

Fig. 8.



This measurement also increaased with increase in the amount of separation of the pubes.

From this it is of course obvious that as the pubic bones are separated, the innominate bones rotate on their long axis so as to carry the iliac crests more in towards the middle line. That is to say the iliac bones instead of inclining from below upwards and outwards become more erect and vertical. For the distance between the anterior superior spine and the pubic spine on the same side is always the same no matter how much you separate the pubic bones of both sides from one another. For even when the pubes are separated, each pubic bone still maintains the same relation to the anterior superior spine of the same side. Thus it comes about that , supposing the symphysis pubis still undivided, the interspinous diameter could only increase its distance from the pubes by each bone rotating on an axis between the sacroiliac joint of its own side and the symphysis pubis so that the iliac crests would move on the circumference of a circle whose centre was on this line, and would pass inwards towards one another and at the same time upwards, as they are not lying at the summit of the circumference of this circle.

Fig. 9.

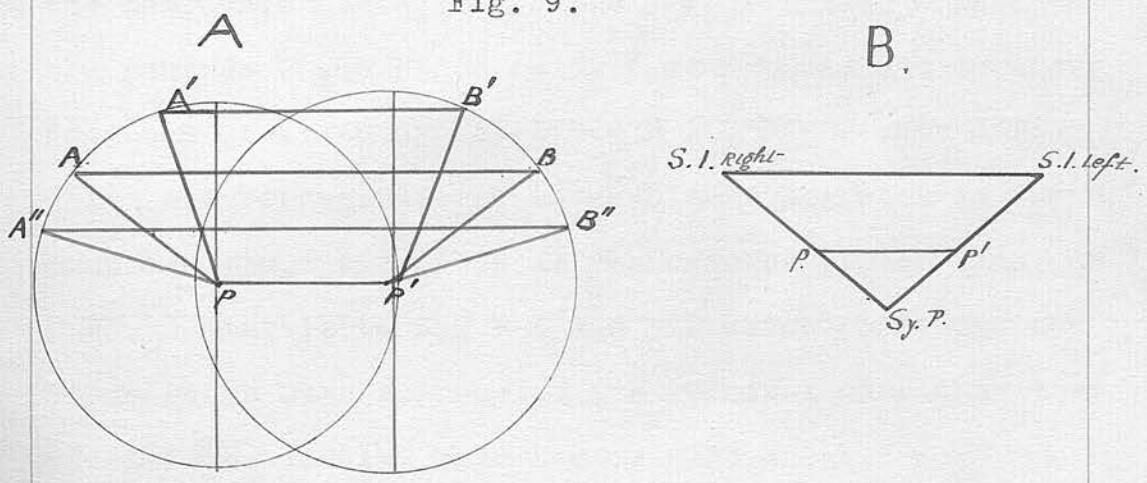


Fig. 9 above will illustrate what is meant.
Fig. 9.B. shows the imaginary axis from each sacroiliac joint to the symphysis pubis in front. P. and P' are points on each of these axes in the same transverse vertical plane as the anterior superior spines. If we imagine a vertical transverse section at the level of P. and P' we get Fig 9.A. Here P A represents the iliac bone of right side, P'B the iliac bone of the left side, and A.B represents the interspinous diameter. Since P A and P'B are unalterable quantities, it is obvious that in order that A B should increase its distance from P P' which represents the level of

the symphysis pubis, the lines P A, P'B must rotate on the centres P and P' so as to pass upwards and inwards, into the position of the lines P A', P'B', when A'B' which now represents the interspinous diameter is further from the symphysis pubis as represented by the line P P'. That is to say P A and P'B which represent the iliac bones have approached the vertical more than they did before, namely, have become more erect.

If on the contrary the lines P A, P'B passed downwards and outwards into the position of the lines P A" , P B", then the line A"B" which would now represent the interspinous diameter would be nearer the symphysis pubis as represented by P P'.

It will of course be noted in these figures that as a result of the erection of the iliac bones, the interspinous diameter becomes more and more shortened, as it becomes more and more erect. Therefore one would expect that if this occurred in symphysiotomy, the interspinous diameter would be shortened. But above, we have been dealing with a closed symphysis. As the pubes are separated from one another they increase the transverse diameters of the pelvis greatly and very evidently as has been shown and much more than the anteroposterior diameters of the pelvis. Indeed

the transverse of brim is increased $\frac{2}{5}$ of a centimetre for each centimetre of separation, and the interspinous diameter by over $\frac{1}{2}$ a centimetre. Thus it is because of this that the interspinous diameter is not actually shortened by the inward rotation of the iliac crests, because the amount of diminution of the interspinous diameter caused by this inward rotation is far more than covered by the amount of increase caused by the separation of the pubes and the consequent carrying of the ilia apart. The increase, however, of the interspinous diameter by symphysiotomy is lessened by the inward rotation.

My first impression was that the increase of distance of the interspinous diameter was not due to the ilia becoming more vertical but was due to the fact that the anterior superior spines as it were retired backwards by the 1st movement described (of rotation of the innominate bones outwards on a vertical axis passing through the sacroiliac joint) while the pubes were advanced by the same movement and thus the interspinous diameter increased its distance from the pubes while still remaining in the same plane and the ilia as it were still forming the same angle with the vertical.

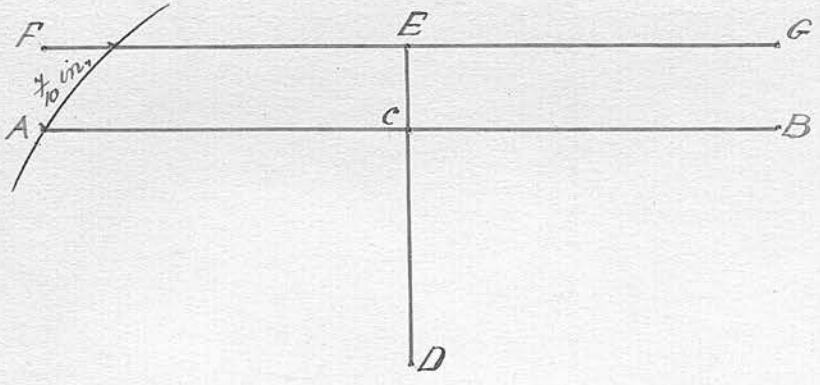
That this is not so is proved by Table D.B. where the bone vertical height above the symphysis of the interspinous diameter was taken and compared with the same vertical height during each increment of separation of the pubes. In every case the anterior superior spines became increased in their vertical height above the pubes. Thus proving that it was a true rotatory movement of the innominate bones on the sacrum.

From Table D.B. it will be seen that in these five cases the average increase of vertical elevation above the pubes of the interspinous diameter was respectively 1.5, 3.5, 2., 4.0 and 1.3 M.M. per cubic centimetre of pubic separation. The mean of these averages is 2 M.M. (the average is 2.4 M.M.) Thus we may say that with 6 C.M. of pubic separation the average increase in vertical elevation of the interspinous diameter above the level of the pubes will be 1.2 C.M. or $\frac{1}{2}$ an inch.

By taking a line A.B. representing the mean of the length of the interspinous diameter and extending vertically from its centre a perpendicular C.D. the mean of the vertical height above the pubes, in these 5 cases, and then drawing a straight line F.G. on the

opposite side of the line A.B. representing the mean length, to that on which the perpendicular is erected, and parallel to that line of mean length and at such a distance from it as the mean increase of vertical height E. C. would give: and by drawing a circle whose centre is at the free extremity D of the perpendicular of mean vertical height C.D and whose circumference passes through the extremity A of the mean interspinous diameter A.B. and the line F.G. parallel to it; — we can measure that the rotation occurred in these 5 pelves through an arc of a circle averaging $\frac{7}{76}$ inches in length.

Fig. 10.



Having, therefore, proved the existence of this rotatory movement of the innominate bone on its long axis, I shall delay the proof of its significance and

of its interdependence on the other two movements of rotation on vertical and transverse axes passing through the sacroiliac joint, till later.

CHAPTER V.

"How the increase of the diameters is brought about and the true significance of the section of the symphysis pubis."

Having described the amount of increase of the pelvic diameters, and the movements that the innominate bones go through, it remains to consider the relation of these two facts, the increase and the movements, to one another.

The diameters in the transverse plane.

The diameters lying in the transverse plane owe their increase to the outward movement mainly, of the pubes. Just as this movement is so much more evident and greater in amount than the other two, so is the increase of the diameters that lie more or less transversely, more evident and greater than that of the true conjugate. But as these diameters in the common rickety type are usually larger than natural, and as even in a small pelvis they are, singly, usually large enough for the foetal head to pass, so the obstruction does not lie in them. Again as they in any case are very little too small, and as a small amount of pubic separation increases them a great deal, Thus therefore their increase is of little significance, as regards the safety of the operation, as the amount of pubic separation would not need to be at all considerable.

From this it follows that part of the function of the outward movement of the pubes which brings about the increase of the diameters lying in the transverse plane, is of little importance.

Conjugata vera.

On the other hand, we have shown and everyone agrees, that the amount of increase of the true conjugata is very small (1.67 M.M.) for each cubic centimetre of separation of the pubes. And as this is a diameter which in a natural pelvis is only just large enough to allow the foetal head to pass and in abnormal pelves is most commonly deficient in size, so the increase of it becomes doubly important. That is to say, the principal interest centres on it because (1) it is smaller than will allow the foetal head to pass and (2) the increase of it got by section of the pubes is very small relatively to the amount of separation necessary.

The movements of the ossainnominata that take part in the increase of the conjugata vera are all three: (1) rotation outward on a vertical axis passing through the sacroiliac joints: (2) rotation downwards on a transverse axis passing through the upper part of the sacrum and through the sacroiliac joints: (3) rotation on the long axes of the bones so that the ilia become more upright.

By the combination of these three movements, a total increase per C.M. of pubic separation is got of 1.67 M.M.

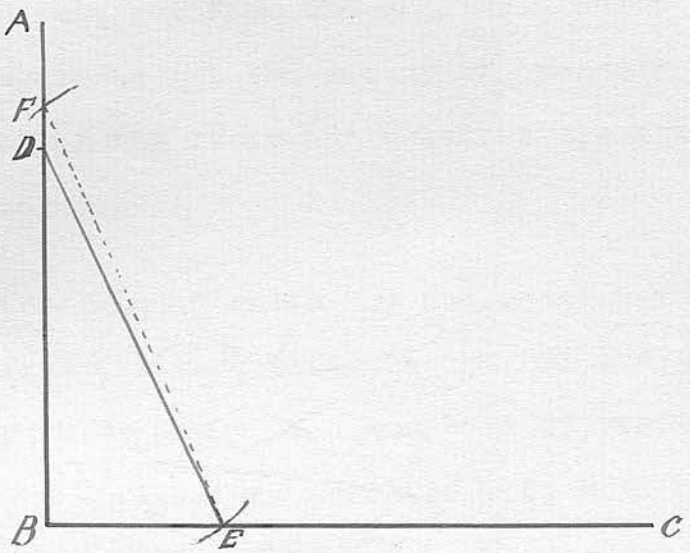
It, therefore, is necessary to try and apportion to each of these movements, its relative share in securing the increase. And it is possible to divide the increase into two parts (1) that due to the descent of the pubes or relative elevation of the sacral promontory: and (2) by subtracting this in each case from the total amount of increase, that due to the outward movement of the pubes. The third movement of rotation on a long axis, I shall show is a movement that merely increases the descent of the symphysis, and the increase due to it is included in that due to descent of the pubes.

To determine amount due to descent of pubes.

To determine the amount of increase due to descent of the pubes, we must know in each case the amount of that descent, and the length of the true conjugate. Then simply (Fig. 11) erect a perpendicular A.B. on a base line B.C. and place a mark on the perpendicular at a distance from B equal to the vertical height of the sacral promontory above the horizontal level (Fig. 11 B.C.) of the upper end symphysis pubis in the

natural state.

Fig. 11.



This gives us the point D. Fig. 11. Then take a pair of compasses whose legs are such a distance apart as is equal to the true conjugate in the natural state. Place the point of the compasses on D. and describe an arc of a circle cutting the base line B.C. representing the horizontal level of the upper end of the symphysis. This gives us the point E. representing the upper end of the symphysis pubis. If now we mark out on A.B. the vertical height of the sacral promontory

after separating the pubes to a certain extent we get the point F. Then the distance from F. to E. gives us now the true conjugate, and by subtracting the figure thus got from the original length of the true conjugate we get the amount of increase due to the descent of the pubes (or relative elevation of the sacral promontory.)

Now over all my cases the conjugata vera averaged 11.28 C.M., and the vertical height of the sacral promontory 10.24 C.M. The increase of vertical height of the sacral promontory averaged 1.64 M.M. per C.M. of pubic separation. For 6 C.M. of separation we get an average increase of vertical height of the sacral promontory of very nearly 1 C.M. Calculating in the preceding method, this gives an increase of the conjugata vera of 9.6 M.M. So that the total average increase for 6 C.M. of pubic separation due to all the movements was (6 x1.67 M.M.) 10.02 M.M.
The increase due to an average rise of the sacral promontory for 6 C.M. of separation was 9.6.M.
Subtract this from the total 10.02 M.M. and we get .42 M.M. left.
Therefore the outward separation on an average, for

a separation of 6 C.M. only accounted for an increase of the conjugata vera of nearly .5 M.M.

The second and third movements accounted for nearly 1 C.M. or more exactly 9.6 M.M.

If we examine each individual case separately by the same method, a similar result is arrived at.

Amount of pubic sepn.	Total increase.	incr. from outward movement.	incr from descent of pubes.
7 C.M.	1.9 C.M.	0	1.9 C.M.
4 " "	1.0 " "	1 M.M.	0.9 C.M.
3 " "	.6 " "	0 " "	6 M.M.
5 " "	1.0 " "	4 " "	6 M.M.
5 " "	1.4 " "	8 " "	6 M.M.
5 " "	1.5 " "	7 " "	8 M.M.
5 " "	.5 " "	?	11 M.M.
3 " "	.5 " "	?	7 M.M.
4 " "	.8 " "	2 " "	6 " "
7 " "	1.5 " "	10 " "	5 M.M.
7 " "	.6 " "	?	11 " "
8 " "	.5 " "	0	5 M.M.
8 " "	1.3 " "	4 " "	9 " "
8" "	1.5 " "	11 " "	4 M.M.
8 " "	1.7 " "	5 " "	12.0 "
8 " "	1.15 " "	5.5 " "	6 " "
8 " "	1.0 " "	6 " "	4 " "
7 " "	.8 " "	.3 " "	5 " "
8 " "	.8 " "	15 " "	7.5 " "
8 " "	1.3 " "	8 " "	5 " "
7 " "	.8 " "	?	13 " "
6 " "	1.0 " "	?	13 " "
7 " "	.9 " "	2 M.M.	7 " "

An examination of the above table shows the following facts:-

In 5 Cases.

outward movement accounted for most of the increase

Total average amt. of incr. per 6 C.M. of pubic separation.	Proportion of total increase due to	
	outward movt.	descent of pubes.
1.8 C.M.	4/part (1 C.M.):	3 (.8 C.M.)
1.2 C.M.	2" (.8 C.M.) :	1 (.4 C.M.)
1.2 C.M.	11" (.88 C.M.) :	4 (.32 C.M.)
.9 C.M.	3 (.54 C.M.) :	2 (.36 C.M.)
.8 C.M.	5 (.5 C.M.) :	3 (.3 C.M.)

In 10 cases.

downward movement accounted for most of the increase

Total average amt. of incr. per 6 C.M. of pubic sepn.	Proportion of total increase due to	
	outward movt.	descent of pubes.
2.25 C.M.	1/part (.15 C.M.):	14 (2.1 C.M.)
1.2 C.M.	2 (.48 C.M.):	3 (.72 C.M.)
1.8 C.M.	7 (.84 C.M.):	8 (.96 C.M.)
1.2 C.M.	1 (.3 C.M.):	3 (.9 C.M.)
.96 C.M.	4 (.3 C.M.):	9 (.66 C.M.)
1.2	5 (.34 C.M..):	12 (.86 C.M.)
.84 C.M.	5½ (.34 C.M.):	6 (.5 C.M.)
.6 C.M.	3 (.23 C.M.):	5 (.37 C.M.)
.6 C.M.	½ (.03 C.M.):	7½ (.57 C.M.)
.6 C.M.	2 (.14 C.M.):	7 (.46 C.M.)

In 3 cases

(the descent of the pubes accounted for all the in-
(crease.

In 5 cases

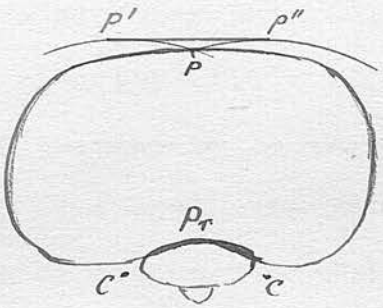
(the amount of increase the true conjugate should
(have derived from the pubic descent was greater

than that actually derived by the effect of all the three movements.

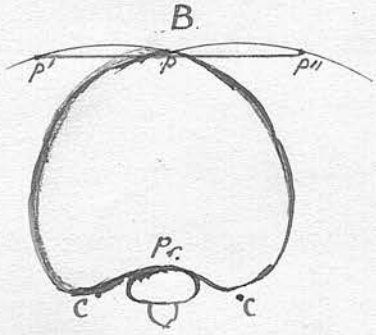
In order to explain these last two sets of cases we must have resource to a diagram.

Fig 12.

A



B.



In Fig. 12. A. we see in a pelvis with the ordinary elliptical brim that the pubes (P) as they execute a purely outward movement on the circumference of a circle whose centre is at C, carry the interpubic line (PP") further from the sacral promontory (Pr.) ; while in Fig 12 B. where the brim is more circular the pubes are already as far from the sacral promontory (pr) as they can get & movement purely outwards of the pubes from one another carries the interpubic line (P'P") nearer the sacral promontory: and thus really detracts from instead of increasing the true conjugate.

Consequently it would appear that in certain cases where there is a circular brim, (i.e. contraction in the transverse diameter) the outward movement of the pubes, hitherto thought to be the great factor in the increase of the true conjugate is in reality a bar to the performance of the operation. Fortunately these cases are such as do not require symphysiotomy for the increase of their true conjugate, it being the transverse diameters that are then at fault; and moreover symphysiotomy increases these transverse diameters greatly. So that in such a case we could get sufficient increase of the transverse diameters with a very small separation of the pubes which would scarcely at all

lessen the true conjugate (either actually or relatively).

On the other hand, in pelves such as flat pelves which are contracted anteroposteriorly and actually or relatively enlarged transversely, the outward pubic movement greatly tends to increase the conjugate.

Function of I. the rotation of ossa innominata on vertical axis.

I. Thus we see that in some cases the outward movement (1) lessens the true conjugate, (2) that usually it helps in the increase of the true conjugate, sometimes and less often being the main factor, sometimes and more often the minor factor in the increase. (3) It increases greatly the diameters which lie in a more or less transverse plane. (4) it permits descent. vide paper read by me before Edin. Obstet. Society Dec. 11th. 01. 18/1/02 vide Transactions

of II the rotation of the ossa innominata on a transverse horizontal axis.

II. The downward movement of the pubes on the other hand, has for its function (1) the increase of the true conjugate, in which increase it is usually the major factor, seldom the smaller factor, and sometimes

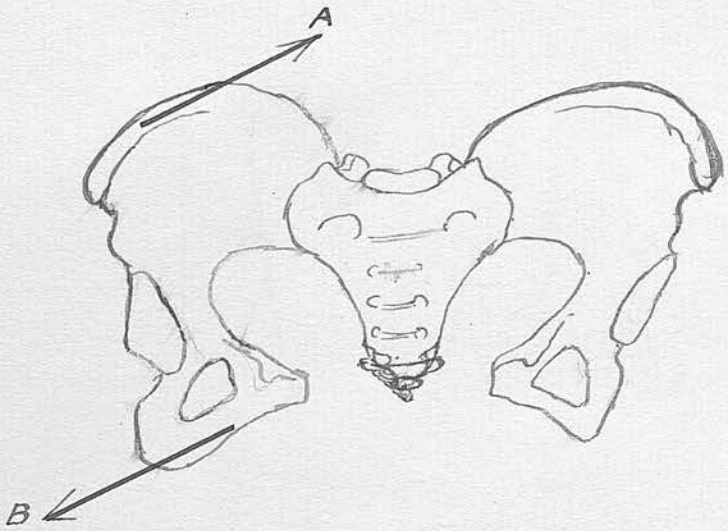
the only factor. (2) It adds to the safety, or rather the more it occurs, the more increase by its means do we get of the conjugata vera and therefore the less we need of the outward movement of the pubes.

of III the rotation of each innominate bone on its long axis.

III. The rotation of the innominate bones on their long axis so that the ilia become more vertical is merely a result of the continuance of the downward movement of the pubes, and the outward movement.

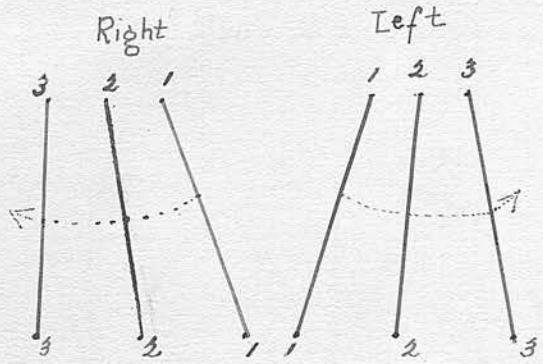
As the pubes move down-wards and out-wards, it follows that the iliac crests move in the same direction. But the further back we pass along the iliac crests, from the anterior superior spines, the more do the bones become fixed by muscular and ligamentous attachments. On the other hand, the ischia and pubes have no such impediments. For all the ligaments and muscles attached to them are greatly slackened by the descent of the pubes. Thus we have the outward and downward force acting freely on the ischia and pubes, but prevented by the strain of the ligaments and muscles attached to the iliac crests, from acting on them . In this way we get Fig 13. which shows the two forces acting on each innominate bone.

Fig. 13.



The force indicated by the direction of the arrow A. represents the detaining action of the muscles and ligaments attached to the ilium. The arrow B. represents in direction the forces acting on the lower part of the bones. The resultant is of course a revolution round its long axis, the iliac crests remaining more in their place while the rest of the bone moves outwards and downwards.

Fig. 14.



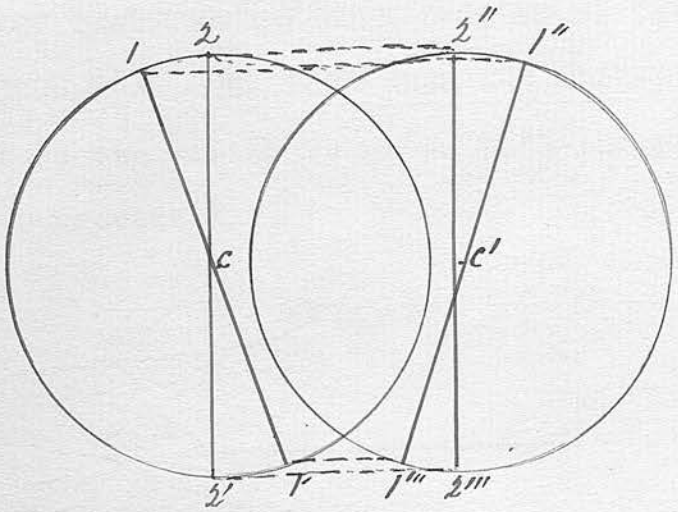
So that a reference to Fig. 14, shows what occurs. The vertical axes of the innominate bones become more erect or vertical, and at the same time the intercristal diameter is increased by the outward movement of the pubes, it being a diameter that lies in a transverse planet.

From this it follows that this movement is a result of the other two movements. Were it only an outward movement of the pubes, there would be no third movement, but as the direction of the arrows show it is the downward movement that specially compels its performance. Andd it is only when these movements are more and more pronounced that it becomes pronounced.

Its effect and function is <u>to increase the downward movement</u> of the pubes. This we can easily see

by yet another figure.

Fig. 15.

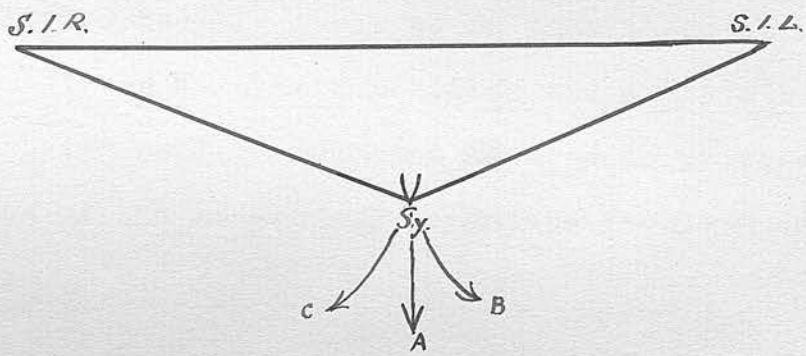


In Fig. 15 we have eliminated the outward movement and a vertical transverse section of the innominate bones 11' and 1''1''' are rotating on their long axes at centres c and c' so that the ilia become more erect. We see that as the ischia and pubes 1' and 1''' pass into the positions 2' and 2''', they become lower in their position. Thus therefore we see that the effect of the rotation on the long axis is to increase the descent of the pubes and ischium.

THE TRUE SIGNIFICANCE OF THE SECTION OF THE PUBIC SYMPHYSIS IN SYMPHYSIOTOMY LIES not in the fact that thereby separation of the pubes is permitted but IN THE FACT THAT THEREBY MORE DESCENT OF THE PUBES BY FAR CAN OCCUR THAN WHEN THE PUBES ARE UNITED.

This can easily be shown both theoretically as well as practically.

Fig. 16.



In Fig. 16, S.I.R. and S.I.L. represent the right and left sacroiliac joints respectively. If the innominate bones (S.I.R. to Sy and S.I.L. to Sy) are to rotate at the sacroiliac joints so as to carry the symphysis pubis (Sy) downwards in the direction of the arrow A. they can only do so to a very limited extent,

because the circular sweeps which each pubis must carry out in order that the symphysis may descend are only coincident during a very small part of their circumference and very soon tend to diverge in the direction of the arrows B and C. Therefore while the symphysis pubis is intact, the descent can only be very limited. But as soon as the connection between the bones is severed, then the pubes are free to depart in the direction of the arrows B and C.

Symphysiotomy only an advanced Walcher's position.

Thus it practically comes to be that there is no difference between Walcher's position and symphysiotomy, the latter being really the means adopted to procure an extension of the mechanical movements involved in the former.

Amount of pubic descent due to Walcher's position contrasted with that after symphysiotomy.

Let us test this by a rough comparison of my results with Walcher's results. Let us test it by the experiments performed on the cadaver with a view to ascertaining the increase of the true conjugate due to descent of the pubes. Zebedeff and Bartoszewicz (Ann. de Gyn. 1899) experimented on 25 adult and 2 infant pelves and got an increase of 3 M.M. Bonnaire and Bué got an increase by Walcher's position of 3 to 4 M.M.

If we regard this as occurring in an average pelvis with a conjugate of 4in or 10 C.M. and a vertical height of sacral promontory of a little under that, say 9 C.M. : then amount of descent of the pubes that occurred was for an increase of even 4 M.M. by Walcher's position, only 5 M.M.

SO THAT BY WALCHER'S POSITION THE GREATEST AMOUNT OF DEPRESSION OF THE PUBES WE CAN EXPECT IS 5 M.M. WHEREAS BY SYMPHYSIOTOMY THE MEAN DESCENT FOR 6 C.M. OF PUBIC SEPARATION IS 8.4 M.M.

CHAPTER VI.

"Practical deductions"

(1) Walcher's position, the position after pubic section.

From the preceding study of the movements of the innominate bones, it is evidently important to place the patient in Walcher's position with the legs hanging down so that their weight tends to drag the pubes downwards. At the same time the sides of the pelvis should be supported so as not to increase the tendency to the outward separation of the pubes. If the limbs are allowed to fall outwards and so strain by their weight on the sides of the pelvis, they will increase the outward movement in opposition to the downward movement of the pubes, thereby greatly increasing the danger to the tissues.

Cazeaux for instance, said that by forcibly drawing asunder the iliac crests one may increase the amount of pubic separation and that this should not be done beyond two inches. I merely remark on this, that while admitting its truth, such a forcible separation will not only tend to rupture the anterior and superior sacroiliac ligaments, but will do far more, by tearing the tissues round about the pubic arch. Therefore such a force should never be used, but the

patient should be kept in the position I have advocated, until the foetal head is past the brim.

(2) How to counteract unequal movement on both sides.

In this way we aim at safe separation of the pubes. But there are instances in which it is necessary to depart from an absolute adherence to this position. Cases have been recorded where one side of the pelvis during the separation moved less than the other side. As a consequence of this, the side that moves less forms a relative projection into the pelvic brim at its most anterior part. That is to say, the more or less circular continuity of the brim is lost, and one pubis lies posterior to the other.

In a good many of my cases I noticed this tendency of one side of the pelvis to move more than the other. In these cases, as the block of wood was slipped in between the pubes, it, as it were, used the non-moving pubis as a lever from which it pushed the other pubis. When this happened, the anterior and superior sacroiliac ligaments on that side which moved most, stretched more and more, that side took on more and more of the total movement, the other side remained practically stationary, and the superior sacroiliac ligament on the moving side very soon yielded

(Doederlein (Cent. f. Gyn) says that over 6 C.M. of separation, the right sacroiliac ligament tears, and so a-symmetric movement is set up.) The ligaments on the non-moving side remain intact.

Thus it would appear that the greater movement on the one side, when once started, even if the inequality of the movement does not have its cause in weaker ligaments on the side with greater movement, leads to greater thinning and ultimate rupture of them or that side, the ligaments of the other side remaining intact. In addition, as in cases recorded by Harris and Jarman, when the foetal head descends, the soft tissues are squeezed between it and the projecting part, and a perforation of the bladder or anterior vaginal wall may result, while the fortal head itself is deeply grooved.

In order to prevent this a-symmetrical movement and therefore its results, a departure from Walcher's position is necessary. By using the lower limbs as levers it is possible to bring a great (but very undesirable) force to bear on the sides of the pelvis, to move them outwards. Whenever during my experiments, one side moved more than the other, I always remedied it by flexing the leg on the thigh and the thigh on

the abdomen on the non-moving side. Then by using the bent up knee as a lever and abducting it forcibly outwards and downwards that side of the pelvis was made to move as it should do, equally and symmetrically with the other side. In this way, instead of the movement being a movement of one pubis from a fixed point formed by the other, it was made a movement of both pubes equally and symmetrically from the original position of the symphysis.

The result was very marked. Instead of all the strain being thrown on the ligaments of one side, it was equally distributed between those of both sides, all relative projection of one pubis into the brim was avoided, and the rupture of the ligaments not only delayed but often avoided for a very much larger amount of pubic separation than that at which they had with the asymmetric movement, shown signs of yielding.

Therefore in cases where such asymmetrical movement tends to occur, the leg on that side on which the movement is less, should be gently and cautiously used as a lever, to obtain the requisite symmetrical movement.

(3). Amount of pubic separation.

The cases must be selected from those whose conjugata vera will not necessitate a greater separation of the pubes than 6 C.M. The minimum conjugate should be $2\frac{7}{8}$ inches.

(4) The operation knife.

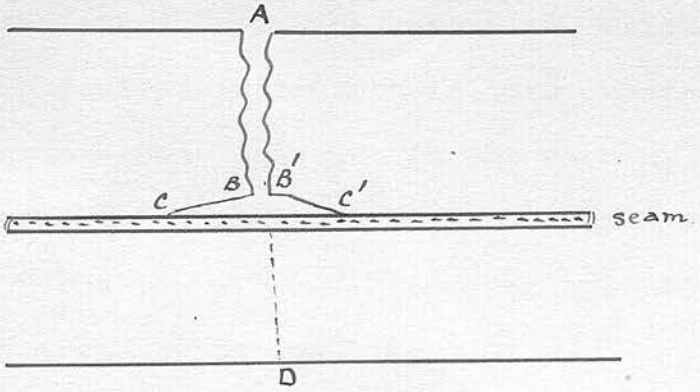
The knife to be used during the operation must be a broad bladed, thin knife. There is nothing more difficult than the division of the symphysis pubis with a narrow bladed or thick knife. The base of the wedge that such a knife forms in cross section presses hard on the cartilage covering the pubes; and prevents the edge being carried easily, further in between them. As a consequence, a great deal of forcible pressure has to be used to divide the symphysis. This may be quite avoided by using a broad bladed, or thin knife which with a little pressure, readily cuts the cartilage in any case: while in pregnant cases the resistance is no more than that offered to the knife by a firm apple.

(5). The subpubic ligament.

In all cases complete division of the symphysis is necessary, but it is questionable whether any definite attempt should be made to sever the subpubic ligament. Many operators do divide it: but I am not inclined to advocate a special effort at its division.

If the joint is completely divided, then no doubt the ligament will be partially divided at any rate, and during the subsequent pubic separation , the rest of the ligament will be gradually torn through. In addition by not specially directing efforts to its division, much of the danger of injury to the vascular structures and other organs in the situation will be avoided. When there is no fibrous structure to resist the outward separation of the pubes, laceration downwards through the vestibule, with its attendant dangers of haemorrhage, and of extension to other structures, will be very imminent. One might compare it to a piece of calico with a seam across the middle. If the calico is torn at right angles to the seam as in Fig. 17

Fig. 17.



from point A, when the tear reaches the seam instead of passing across it, it runs in the directions B C, B'C' along the seam. The subic pubic ligament represents the seam and the calico beyond it, the vulva and vestibule. If one cuts across the seam the tear now extends in the direction of the dotted line to D. So also, severance of the subpubic ligament will tend to extension of the tear in a similar direction.

(6) State of the joint.

Ossification of the cartilage of the joint, if it occurs at all, must be very rare. It was never present in any of my cases, nor in those whose symphysis pubis only I was able to examine, many of them as old as 70 years. Wehle also doubts its occurrence as a result of age. He did not find it in 10 cases of over 60 years of age. In pregnant women, on the other hand, the ease with which the symphysis is divided is remarkable, and contrasts very much with nonpregnant cases. In one case at any rate, microscopic examination of the cartilage, showed the formation of cell clusters, and peculiar degenerated areas, quite peculiar.

Therefore from a consideration of my own observations, and those of Wehle, and in view of the

structural changes that occur throughout the pelvis during pregnancy, I believe that ossification of the joint is a curiosity of the rarest kind.

(7) Importance of localising the site of the upper end of symphysis.

This leads us to a consideration of those cases when the joint was said to be ossified. I think it will always be found that this was due to the fact that the line of the joint was missed and one or other pubic bone severed. Not only does this involve great delay and difficulty in cutting, and a danger of breaking the knife, but as a result the detached end of the pubic bone necroses and a sequestrum forms which has to be eliminated and which delays greatly the patient's convalescence. Lewers of London, Feb. 1893, operated on a case in which he had to have recourse to the saw. Necrosis occurred and the patient recoverd, although the ultimate issue was delayed. Harris agrees in saying that cutting off the end of the bone involves its necrosis and the formation of a discharging fistula.

Localisation of site of upper end of symphysis.

It is necessary therefore to get some means of localising the upper end of the symphysis pubis.

In 24 of my cases.

12 or 50% had the upper end of symphysis in median line

8 or 33⅓% " " " " " to the left of median line

4 or 16⅔% " " " " " " right "

In 60 cases Wehle found

8 or 13⅓% had upper end of symphysis in median line

40 or 66⅔% " " " " " to left of median line.

12 or 20% " " " " " " right " "

Both sets of observations agree in stating that only in the large minority is the symphysis pubis to the right of the median line.

Wehle had most cases to the left of the median, I had most median.

In my cases those to the left of the median line varied in being from 4 M.M. to 7 M.M. to the left: those to the right from 6 M.M. to 1 C.M. to the right.

In estimating the position of the upper end of the symphysis pubis, I thought it wise to do so, by measuring the distance from each anterior superior spine to the upper end of the symphysis pubis. This I did for the following reasons:- (1) If a fixed relation to them were established, the anterior superior spine would be handy landmarks for the operator.

(2) It was difficult to fix the median line by reference to the body. (3) Any other method of fixing the site would be open to similar objections to this one. One might say that one osinnominatum being smaller than the other would make the conclusions wrong. But such an accident would similarly affect the other methods such as taking the median line as midway between the sides of the body.

There, however, could be found no definite site for the upper end of the symphysis. All that one can say from measurement is:-

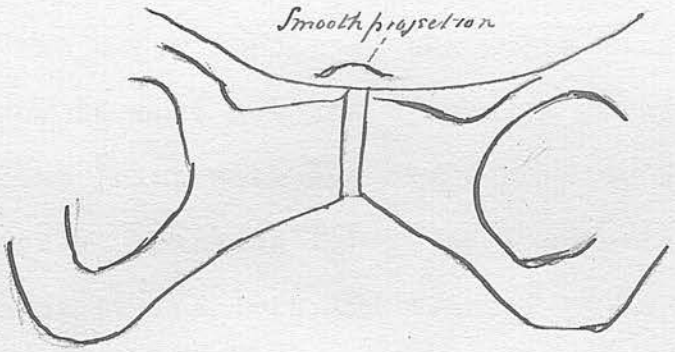
"If one does not find the upper end of the symphy-
"sis pubis in the median line, it is much more probably
"situated to the left than to the right of the
"median line."

Whether the fact of its being more usually to the left is connected with the greater amount of development of the bones of the right side, it is impossible for me to say.

Since measurement cannot localise the upper end of the symphysis pubis, it is important to find something else that does. In every one of my cases more or less marked were definite ridges mapping out the true line of the joint.

(1) The upper end of the symphysis pubis is surmounted by a distinct elevation or ridge. This is easily visible to the naked eye and even more readily felt by the finger. It consists on cutting into it, of a firm substance composed of thickened periosteum and ligamentous fibres together with a thickening of the tendinous fibres of the muscles inserted at this point. I figure it diagrammatically below (Fig. 18)

Fig. 18.



(2). Running down from this elevation, and continuous

with it , a long low ridge marks the site of the joint on the posterior aspect of the contiguous ends of the pubes. It is formed by the apposition of the slightly everted posterior margins of the inner ends of each pubic bone coated by thickened periosteum. These two ridges in apposition make the long low ridge, and taken in conjunction with the elevation on the summit mark out not only the site but the direction of the joint.

Procedure to find joint.

What should be done is as follows:- Having made an incision, no matter whether above the symphysis pubis or in front of it, the index finger should seek first of all the upper border of the pubic bones, and then endeavour to make out the elevation marking the upper end of the joint with the ridge running down from it posteriorly; seeking for it at first in the median line, next to the left and finally if necessary to the right, and remembering that it may be as far off as 1 C.M. from the median line.

Thus the exact upper edge and the direction of the symphysis pubis will be found, and all danger of slicing off the end of the bone avoided. I say "direction" advisedly, for as the posterior ridge is

formed by the edges of the bones, in cases where the upper end of the joint was not median, this ridge sloped inwards to the median line below.

8) Septic discharge a contra-indication.

Finally looking to the number of deaths from sepsis, and to the frequency of localised sepsis, the operator must be rigidly aseptic in his methods, and preferably antiseptic: and further regarding these deaths from sepsis, since so many occur in patients who have been the subject of a foul vaginal discharge, (indeed I may say this discharge existed in the greater majority (of fatal septic cases), the existence of such should be looked upon as a contra-indication to the performance of symphysiotomy.

Note.
In binding this volume, the bookbinder has reversed the order of the last 9 cases, & there was no time to get the fault remedied. A.J.S.

Case 1. aet. 21 yrs. dead about 11 hours.

Pregnancies	Labours	Symphysis Pubis	Amount of separation	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conj. diag. (int.)	Brim: Transverse	Brim: Right oblique	Brim: Left oblique	Intertrochanteric	Height of sacral prom. (vertical) above Sy. Pubis	Interspin. dr.	True pelvis: Vertical depth of Post. wall	True pelvis: Side wall	True pelvis: Ant. wall	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
0	0	intact	·	15·	26·	21·	11·3	13·	12·1	12·5	11·	26·	10·5	8·	12·	11·	4·5	pat.t a nullipara; therefore separation of pubes very difficult. Bladder and urethra unharmed. Vestibule thinned and stretched between the bones and finally tore.
		divided	1	15·5	26·5	21·1	11·35	13·2	12·8	12·8	12·	26·9						
			2	15·8	27·	22·	11·4	13·5	13·2	13·	12·5	27·8						
			3	15·9	27·9	22·3	11·5	13·6	13·5	13·2	13·	28·5						
			4	16·	28·	22·6	11·55	13·7	13·6	13·8	13·3	29·4						
			5	16·1	28·2	22·9	11·6	13·75	13·7	13·9	13·5	30·3						
			6	16·15	28·9	23·1	11·7	13·8	14·1	14·	13·8	31·2						

Case 2. aet. 66. dead 22 hours.

Pregnancies	Labours	Symphysis Pubis	Amount of separation	Ext. diag. conj.	Intercristal	Interspinous	Conj. vera	Conj. diag. (int.)	Brim: Transverse	Brim: Right Oblig.	Brim: Left Oblig.	Intertrochanteric	Height above sp. of Sacral Prom. (vertical)	and of Intersp. dr.	Vestibule to Post wall	True pelvis: Side wall	True pelvis: Ant. wall	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
multipara.	no record.	intact	·	16·	28·	24·6	8·6	11·	13·2	12·5	11·5	31·	7·5	7.	12·	10·2	5·2	Separation of pubes much easier than in case 1. Vestibule stretched - did not tear. At 5 Cm. of separation right superior sacroiliac lig.t yielded. After that the increase was mainly affected by movement of the right innominate bone. Urethra &c. unharmed.
		divided	1	16·1	28·2	25·	8·65	11·4	14	13·2	12·2	·						
			2	16·2	28·5	25·3	8·7	12·	14·5	13·4	12·5	32·4						
			3	16·5	28·8	25·5	8·8	12·2	14·8	13·5	12·9	32·5						
			4	17·	29·	25·6	8·9	12·5	15·5	13·8	13·2	32·9						
			5	17·3	29·1	27·	9·	13·	15·8	14·	14·1	33·5						
			6	17·6	29·2	27·9	9·2	13·1	16·	14·8	14·2	34·						
			7	17·9	29·3	28	9·4	13·5	16·2	15·3	14·4	34·1						

Case 3. aet. 40 dead 15¼ hours.

Pregnancies	Labours	Symphysis Pubis	Amt. of separation	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conjug. diag. (int.)	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Intertroch. i.e.	Height above Sy. Pub. of Sacral Prom. (vertical)	and of Interspin. dth. vertical depth	True pelvis: Post. wall	True pelvis: Side "	True pelvis: Ant. "	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
2	?	intact	·	17·1	23·6	20·3	12·	13·1	12·5	12·1	12·	27·9	11·	9·2	13·4	9·5	5·	Vestibule - thinned + stretched greatly. Prowchowniks' Callipers used in this + succeeding cases. At 5 c.m. of separation left inf. sacroiliac and at 6 c.m. right superior sacroiliac ligament, yielded. In this case it was first noticed how effective and powerful was the leverage got by bending up the thighs on the abdomen, and forcibly abducting them while in this position.
		divided	1	17·5	24·2	21·2	12·2	13·3	13·	13·	12·7	28·8	·	·				
			2	17·55	25·	21·8	12·6	13·9	13·6	13·2	13·	29·4	·	·				
			3	17·8	25·2	22	13·1	14·	13·9	13·35	13·3	29·8	·	·				
			4	17·9	25·4	22·55	13·2	14·1	14·2	13·5	13·55	30·3	·	·				
			5	18·4	25·6	23·2	13·3	14·15	15·	14·	13·9	30·8	·	·				
			6	18·5	25·9	23·8	13·6	14·5	15·5	14·8	14·5	31·5	-	·				

Case 4. aet. 67. dead about 16 hours.

Pregnancies	Labours	Symphysis Pubis	Amount of separation	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conj. diag. (int.)	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Intertroch.	Vertical Height above Sy. P. of Sacral Prom.?	and height of Intersp. dtr.	True pelvis: Vertical depth Post. wall	True pelvis: Side wall	True pelvis: Ant. wall	
?	?	intact	C.M. ·	An abscess over the lumbar spines prevented the measurement of this diameter.	24.9	23.8	11.25	12.6	14.7	14.	13.1	Rheumatic arthritis prevented this diameter from being of use for measurement.	10.4	9.5	13.5	8.9	5.9	At 3 C.M. of separation, the fibres of the left anterior sacroiliac ligament began to tear, or rather the superior, just in a line with the salient angles of the auricular surfaces. Pubes separated easily.
multipara.	no record.	divided	1		25.3	23.9	11.5	12.9	15.3	14.15	14.		11.2	9.8				
			2		25.5	24.1	11.6	12.95	15.6	14.9	14.15		11.4	9.9				
			3		25.8	24.5	12.1	13.5	15.9	14.9	14.85		11.4	9.95				
			4		25.95	24.9	12.3	13.65	16.2	14.95	15.5		11.6	10.5				
			5		26.05	25.3	12.35	13.65	16.7	15.35	15.85		11.6	11.2				
			6		26.1	25.6	12.75	13.7	17.	15.5	15.9		12.3	11.8				
			7		26.5	26.1	13.1	14.1	17.4	15.7	16.1		12.4	11.8				

Case 5. aet, 38. died Nov. 2nd. P.M. Nov. 3rd.

Pregnancies	Labours	Symphysis Pubis	Amt. of separation	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conjug. diag. (int.)	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Intertroch. ic	Height above Sy. P. of Sacral Prom. (vertical)	and of Intersp. dts., Vertical depth	True pelvis: Post. wall	True pelvis: Side wall	True pelvis: Ant. wall
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
0	0	intact	·	17.	24.9	21.9	12.5	13.9	13.35	12.9	12.85	29.3	11.2	9.3	14.3	9.5	5.1
		divided	1	17.65	25.	22.2	12.95	14.1	13.6	13.15	13.1	30.2	11.5	10.1			
			2	18.25	25.2	23.	13.	14.3	14.1	13.5	13.5	31.2	12.	10.2			
			3	18.3	25.6	23.2	13.45	14.75	14.7	13.9	14.2	31.8	12.5	10.6			
			4	18.4	25.7	23.8	13.5	14.9	14.9	14.1	14.6	32.2	13.	10.8			

Symphysis pubis - median.
Cartilage of " " - unossified.
At separation of 3 c.m. fibres of right superior sacroiliac ligament ruptured in a line with the salient angles of the auricular surfaces. Thereafter all increase was on the right side.

Case 6. aet. 38 — 3 months pregnant

Pregnancies	Labours	Symphysis Pubis	Amount of separation	Ext. diag. conj.	Intercristal	Interspinous	Conj. vera	Conj. diag. (int)	Brim: Transv.	Brim: Right obl.	Brim: Left oblq.	Intertroch.	Height above S.P. Lateral Prom. (rect.)	Intersp. dr. and of	True pelvis: Vertical depth Post. wall	True pelvis: Side wall	True pelvis: Ant. wall	
1	abortion @ 3rd month.	intact	·	19.1	28.5	23.4	12.35		15.4	13.11	14.	33.0	9.0	7.8	9.9	8.2	6.0	Pubic symphysis - median. Cartilage of " - quite unossified " " " much more easily divided than usual.

see "infra".

The peculiarity of the above measurements led me to discover that there was a comminuted fracture extending completely through the alae sacri. The Sacrum was relatively displaced downwards. I record the case because the condition of the Joint in a 3 month's pregnancy is interesting. She aborted 10 days before death.

Case of ... aet. 50 dead 25½ hours.

Pregnancies	Labours	Symphysis Pubis	Amount of separation	Ext. diag. conj.	Bisiliac	Interspinous	Conjug. vera	(Int.) diag. conj.	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Intertroch. i.e.	Height above symphysis of sacral prom. (pelvis)	Angle of Interspini. dt.	Vertical depth of True pelvis: Post. wall	True pelvis: Side wall	True pelvis: Ant. wall	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
No of preg: cies not recorded. multipara.	not recorded.	intact	.	16.6	27.05	22.8	10.7	12.1	14.5	13.9	13.15	Too much fat for accurate measure-ment	9.3	8.2	10	8.5	5.	Symphysis pubis - 6 m.m. to left of median. Cartilage of pubis - quite unossified. Amount of spontaneous separation of pubes after section 1.1 c.m. At 3 c.m. of separation left superior sacroiliac ligament yielded at usual site: at 5 c.m. it went completely.
		divided	1	L. 16.95 R. 16.5	27.05	23.5	L. 10.7 R. 10.9	L. 11.85 R. 12.1	14.55	14.2	14.1		10.	9.				
			2	L. 17.9 R. 17.2	27.1	23.8	L. 11. R. 11.3		14.65	14.4	14.3		10.2	9.6				
			3	L. 17.45 17.45 R. 17.4	27.1	24.3	L. 11.3 11.25 R. 11.4	L. 12.1 12.2 R. 12.4	15.2	14.5	14.3		10.5	10				
			4										10.5	10.				
			5										10.6	10.2				

Case 8. Aet. 56 dead 61 hours.

Pregnancies	Labours	Symphysis Pubis	Amount of separation	Ext. diag. conj.	Bisiliac.	Interspinous	Conjug. vera	Conj. diag. (int.)	Brim: Transverse	Brim: Right obliq.	Brim: Left obliq.	Intertroch. i.e.	Height above of Sacral Prom.	and of Intersp. dk.	True pelvis: Vertical depth Post. wall	True pelvis: Side wall	True pelvis: Ant. wall
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
?	?	intact	·	17·3	26·2	23·8	10·3	11·5	12·35	12·	12·	27·1	10·	7·	11·	9·	5·
		divided	1	17·5	26·5	24·4	10·4	11·9	12·8	12·5	12·3	28·	10·	7·2			
			2	18·1	26·9	24·9	10·8	11·95	13·3	12·95	12·6	28·6	10·2	7·5			
			3	18·25	27·2	25·4	11·	12·05	13·8	13·6	13·	29·1	10·6	8·			
			4	18·3	27·5	26·4	11·2	12·1	14·3	13·7	13·5	30·4	10·6	8·3			
			5	18·6	27·9	26·9	11·3	13·	14·9	13·9	14·2	31·4	10·7	8·6			

Symphy. pubis – median, and its cartilage quite unossified.

Amt. of spontaneous separation after section 1 M.M.

At 4 c.m. of pubic separation right sacroiliac ligament began to break in usual site: and as usual, that side of the pelvis to take on a larger share of the movement. It was now found that using the left ~~flexed~~ thigh flexed on the abdomen as a lever to abduct that side of the pelvis, that the left side could be made to move "pari passu" with the right side.

In this way, separation was carried up to 8 c.m. without either ligament breaking any more than it had done already.

Case 9. aet, 37. dead 3 hrs. Postpartum

Pregnancies	Labours	Symphysis Pubis	Amount of separation	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conj. diag. (int).	Br. im. Transverse	Br. im. Right oblig.	Br. im. Left oblig.	Intertroch., ie	Height above sym. p. of Sacral Prom.y and of Interspin. dt.				
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
?	?	intact	.	18.5	25.9	23.5	13.9	14.9	13.5	13.5	13.	29.9	12.	8.	.	.	.
		divided	1	19.	26.2	24.	14.	15.	13.9	13.6	13.2	30.6	12.2	8.5			
			2	19.1	26.3	25.	14.3	15.1	14.15	13.9	13.3	31.2	12.5	8.7			
			3	19.2	26.5	25.3	14.5	15.6	14.5	14.1	13.9	31.3	12.6	9.4			
			4	19.6	26.8	25.8	15.2	15.65	15.1	14.55	14.4	32.	12.7	9.7			
			5	19.7	27.	26.4	15.3	15.7	16.1	14.55	15.1	32.5	12.8	10.2			

Patient dead only 3 hours.
Symph. pubis median, & its cartilage quite unossified.
Amt. of spont. sep.n after division 2 M.M.
At 8 c.m. of sep.n no break occurred in ligaments (pat.t was puerperal).
Other organs unaffected.
Vestibule thinned & stretched.

Case 10. aet. 53. dead 42 hours.

Pregnancies	Labours	Symphysis Pubis	Amount of separation	Ext. diag. conj.	Bisiliac	Interspinous	Conjug. vera	Conjug. diag. (int)	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Intertroch.	Height above Sym. Pubis of Sacral Prom.	and of Interspin. dip.	Vertical depth of True pelvis: Postr.	True pelvis: Side	True pelvis: Ant.
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
multiparous	no other record.	intact	,	16.3	27.7	24.4	10.5	12.2	14.4	13.4	13.	29.6	9.5	9.	12.	8.5	5.9
		divided	1	16.6	28.	25.	10.6	12.4	14.5	13.9	13.3	30.5	9.7	9.5			
			2	17.2	28.2	25.3	10.8	12.5	14.8	14.05	13.6	31.	10.	9.7			
			3	17.5	28.5	26.	11.	13.	15.	14.2	14.	31.5	10.1	9.8			
			4	17.9	28.6	26.8	11.4	13.2	15.6	14.6	14.6	32.1	10.3	10.2			
			5	17.9	29.1	27.6	12.	13.3	16.	15.1	14.9	32.5	10.4	10.3			

Symphy. Pubis 4 M.M. to left of median.
Cartilage of Sym. Pubis not ossified.
Amt. of spont. sepn. after division 3 M.M.
At 3 C.M. of separation left sacroiliac ligt. yielded in usual site. Left side took on all the movement, and by adopting the manoeuvre described in the text, of using the flexed right thigh as a lever by abducting it, the separation was carried to 4 c.m. and to 5 c.m. with equal movement on both sides and without further rupture of left sacroiliac ligt.
At 4 c.m. Right sacroiliac ligt. yielded in the usual site.
Sacral promy. unusually low.

Case 11. aet 34. dead 19 hours. 5 weeks post partum

Pregnancies / Labours	Symphysis Pubis	Amount of separation	Ext. diag. conj.	Bisiliac	Interspinous	Conjug. vera	Conj. diag. int.	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Intertroch.ic	Hight above Sy. Pubis of Sacral Prom.	of Interspin.; sh.	True pelvis: Post. wall	True pelvis: Side "	True pelvis: Ant.	
		C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
died of pernicious anaemia 5 weeks post partum.	intact	.	16·7	24·1	22·2	11·5	12·2	14·1	12·8	13·6	26·6	9·8	6·5	10·4	7·3	5·5	Symph. pubis & M.M. to right. Cartilage of " " very soft as pat: was puerperal. Amt. of spont. sepn. after division large for same reason. & M.H. Sepn. was easy up to 9 cm. At sepn. of 8 c.m. right sacro-iliac ligament yielded a little in usual site. Increase of this at 9 c.m.
	divided	1	17.	24·8	22·65	11·55	12·9	14·65	13·2	13·9	27·5	10·1	7·4				
		2	17·2	24·9	22·9	11·6	13.	15·–	13·4	14	27·6	10·3	8·2				
		3	17·8	25·–	23·5	11·7	13·1	15·3	14·	14·4	28·4	10·5	8·7				
		4	17·9	25·2	23·9	11·9	13·2	15·7	14·4	15·	29·2	10·7	9.				
		5	18·2	25·4	24·4	12	13·3	16·1	15·1	15·1	30.	11.	9·5				

Case 12. aet. 36. dead 20 hours.

Pregnancies	Labours	Symphysis Pubis	Amt. of Sep.n	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conjug. diagonal	Brim: Transverse	Brim: Right oblique	Brim: Left oblique	Intertroch.	Height above Sy. pubis of Sacral Prom.y	Interspin. dts	True pelvis: Vertical depth of Post. wall	True pelvis: Side "	True pelvis: Ant. "
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
0	0	intact	.	20·5	26·85	24·8	14·5	16·3	14·2	14·	14	32·5	13·5	9·1	16·	9·8	5·
		divided	1	20·8	27·	25·	14·6	16·45	14·3	14·3	14·3	33·2	13·9	9·3			
			2	20·85	27·25	25·5	14·8	16·8	14·6	14·75	14·75	34·1	14·	9·4			
			3	20·85	27·25	26·05	15·	16·85	15·	15·2	15·3	34·8	14·3	10·			

Symphysis pubis 6 M.M. to left of median
Cartilage of " " unossified joint.
No spont. sep.n on division.
Sacral Prom.y unusually high above Sy. pubis: and post. wall of true pelvis unusually long. Pelvic brim more heart shaped than kidney shaped.
At 3 cm. of sep.n right sacroiliac lig.t gave way a very little, at usual site. As a consequence, right side moved more than left; wh. was remedied by manoeuvre described in text.
Periosteum raised off ilia by the strain of attached sacroiliac lig.ts.
Sep.n not carried above 5 C. M. owing to the great difficulty of separation even with great force, in this case.

Case 13. aet. 58 dead 40 hours.

Pregnancies	Labours	Symphysis Pubis	Ant. of sep.n	Ext. diag. conj.	Bisiliac	Interspinous	Conjug. vera	Conjug. diagonal	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Intertrochanteric	Height above Sy. of the Sacral Prom. and	Interspinous	True pelvis: Vertical Height Post. wall	True pelvis: Side "	True pelvis: Ant. "	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
multipara no record		intact	.	15·9	24·3	21·4	10·4	12·8	13·25	12·	* 10·8	27·3	9·2	7·3	13·	8·	4·5·	Symph. pubis 6 m.m. to left of median cartilage "Sy"., quite unossified. No sep.n spont.y after division. No rupture of ligament at 8 cm. of pubic sep.n Left Sacroiliac Joint was sawn out, & its condition described in text.
		divided	1	16·8	24·8	21·9	10·5	13·	13·8	12·4	11·2	28·2	9·4	7·4				
			2	17·	25·4	22·3	10·9	13·4	14·1	13·	11·3	29·	9·5	7·5·				
			3	17·5	25·6	22·9	11·1	13·5	14·4	13·5	11·9	29·2	9·7	7·7				
			4	17·6	25·7	23·5	11·2	13·55	14·8	12·3	12·8	30·	9·9	8·2				

* Shortness due to site of Symphysis Pubis.

Case 14. aet. 25. dead 50 hours.

Pregnancies	Labours	Symphysis pubis	Amt. of sep.n	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conj. diag. (int.)	Brim: Transverse	Brim: Right Oblig.	Brim: Left Oblig.	Intertroch. ic	Height above Sy. Pubis of Sacral Prom.y	and Intersp. Isc.	True Pelvis: Vertical height of Post. wall	True Pelvis: Side "	True Pelvis: Ant. "	
			c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	c.m.	
2.	natural.	intact	.	18·5	23·5	20·5	11·1	13·	13·5	12·1	12·	26·5	10·	7·3	12·5	8·5	4·5 -	Sym. pubis 1 C.M. to right of median. Cartilage of sy. pubis unossified. Amt. of spont. sep.n after division 3 M.M.
		divided	7	20·	25·	24·9	12·6	13·9	14·9	14·9	14·1	30·5	10·6	9·				

Case 15. aet. 39 yrs. dead 7 9 hrs of Pneumonia. 7 mos pregnant.

Pregnancies	Labours	Symphysis Pubis	Amt. of separation.	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conj. diag. (int.)	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Height above sy. pubis of sacral prom.	and of interspin. dts	Vertical height Post wall	Inner pelvis: Side wall	Inner pelvis: Ant. wall
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
multipara	while dying was delivered of 7 mo. foetus.	intact	·	16·2	25·5	23·5	10·5	12·2	13·5	12·9	12·9	9·2	7·2	13·5	7·5	4·5
		divided	1	16·5	25·8	23·8	10·55	12·7	13·9	13·1	13·	9·3	7·3			
			2	16·7	26·	24·2	10·6	12·9	14·3	13·3	13·1	9·4	7·4			
			3	16·9	26·2	24·7	10·65	13·	14·6	13·4	13·2	9·5	7·5			
			4	17·1	26·3	25·1	10·7	13·1	14·95	13·7	·	9·55	7·5			
			5	17·3	26·5	25·5	10·8	13·3	15·4	14·	14·	9·6	7·85			
			6	·	·	·	·	·	·	·	·	·	·			
			7	17·8	26·6	26·3	11·1	13·5	15·9	14·2	14·2	9·9	9·			

Site of sym. pubis 8 M.M. to right
no ossification
Amt. of sep.n after division 4 M.M.
At 8 c.m. of pubic sep.n left sacro-iliac ligament tore a little in usual site. Periosteum of left innominate raised in a continuous sheet off the surface of the bone by the tension of the ligament.
Division of sym. pubis very easy.
As usual, edge of sacral ala raised above that of ~~iliac~~.

Case 16. aet., 52. dead 17 hrs.

Pregnancies	Labours	Symphysis Pubis	Amt. of separation	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Intl. diag. conj.	Brim: Transverse	Brim: Right oblq.	Brim: Left oblq.	Intertroch.	Height of sacral Prom. above Sy. Pubis	and of Intersp. lt.	True pelvis: Post. wall	True pelvis: Side	True pelvis: Ant.
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
multipara	no record.	intact	·	15.2	24.2	20.9	10.5	12.4	13.1	12.	12.4	28.4	9.	8.9	10.	8.5	5.4
		divided	8	16.	24.9	23.5	11.	13.9	15.	14.4	15.	29.8	10.	11.3			

Site of sym., pubis median.
no ossification of joint.
Amt. of spont. sep., after division 2 M.M.
ligaments did not rupture

Case 17. aet. 30 yrs. dead 28 hours.

Pregnancies	Labours.	Symphysis Pubis	Amt. of Separation	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conjug. diag. int.	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Intertroch. ic	Height above Sy. Pubis of Sacral Prom.y and of	Interspin. dt.	True pelvis: Post. wall	True pelvis: Side "	True pelvis: Ant. "	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
multipara	no record	intact	.	18.	30.5	28.	12.3	14.5	14.5	14.	13.5	30.	11.	7.9	12.2	8.	4.7	
		divided	8	20.	33.	32.2	13.6	15.3	18.1	17.2	16.	34.	12.	10.5				

Site of Symph. Pubis median. no ossification of cartilage. Amt. of spont. sep.n after pubio section 2 M.M.
At 8 cm. of sep.n left ant. sacro:iliac ligament tore in usual site. Periosteum raised off Innominate bones by the ligt.

Case 18. aet. 44. dead 12 hrs.

Pregnancies	Labours	Symphysis pubis	Amt. of sepn.	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conj. diag. (int.)	Brim: Transverse	Brim: Right oblig.	Brim: Left oblig.	Intertroch.	Height of sacral prom. above sym. pubis	True pelvis: Interspin. sh.	True pelvis: Post. wall	True pelvis: Side "	True pelvis: Ant. "	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
no record.		intact	·	16·	24·4	21·1	10·3	12·5	12·	11·5	11·5	23·6	9·7	7·1	14·	7·9	4·5	Site of sym. pubis 5 M.M. to left Cart. of " " unossified Amt. of spont. sepn. 1 M.M.
		divided	8	16·5	27·7	26·4	11·8	13·9	15·7	14·7	15·1	30·8	10·2	8·7				At 7 c.m. of sepn. left sacro-iliac ligt. broke in usual site.

Case 19. aet 44. dead 22 hrs.

Pregnancies	Labours	Symphysis Pubis	Amount of separation		Bisiliac	Interspinous	Conjug. vera	Conj. diag.	Brim: Transv.	Brim: Right obl.	Brim: Left obl.	Intertroch.ic	Height above Sy. Pubis of Sacral Prom.	Intersp. dt.	vertical depth of True pelvis: Post. wall	True pelvis: Side wall	True pelvis: Ant. wall	
				C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
multipara		intact	.	.	24.3	19.5	11.25	12.95	12.6	12.5	12.5	28.6	10.	7.4	12.5	7.5	5.	Site of Sy. Pubis 4.5 M.M. to left. no ossification of cartilage Amt of spont. sepn. after division 2 M.M.

Case 29. said to be 56 yrs old. looked much older. dead 24 hours

Pregnancies	Labours	Symphysis Pubis	Amt., of Sepn.	Ext. diag., conj.,	Intercristal	Interspinous	Conjug., vera	Transverse (Brim)	Right obl., (Brim)	Left oblig., (Brim)	Intertroch, ic	Height above Sy. P. of Sacral Prom. (vert)	and of Intersp. dr. (vert)	Conj., diag. int.	Vertical depth of Post., wall (True pelvis)	Side wall (True pelvis)	Ant., wall (True pelvis)
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
6(?)	?	intact	.	17.	24·4	18·4	12·4	12·8	12·8	12·8	28·4	11·5	7·4	15·	15·	10·	5·
		divided	7	17·6	26·6	22·6	13·3	15·9	15·6	15·1	33·6	12·3	8·3	16·4			

Site of Sym., Pubis median, and cartilage quite unossified.
Amt., of spont., sepn. after division 1 M.M.
At 3 C.M. of sepn. left sacroiliac ligt. ruptured in usual site.

Case 28. aet 32. dead 33 hours.

Pregnancies	Labours.	Symphysis pubis	Amount of separation	Ext. diag. conj.	Bisiliac.	Interspinous	Conjug. vera	diag. conj. (int.)	Brim: Transverse	Brim: Right Obl.	Brim: Left Oblique	Intertroch. ic	Vertical height above Sy. pubis of Sacral prom.	and of Intersp. ch.	Depth of Post. wall (True pelvis)	Side " (True pelvis)	Ant. " (True pelvis)	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
multipara	no record.	intact	·	17·9	25·4	23·	12·	14·	13·5	12·2	11·5	28·5	10·7	6·4	14·	8·	4·6	Site of symphy. pubis median. Cartilage of " " quite unossified. Amt. of spontaneous sepn. after pubic section 5 M.M.
		divided	6	18·8	26·4	26·1	13	16·	15·1	13·7	13·6	32·	12·	8·8				Rupture of right sacroiliac sup. ligt. in usual site at 3 c.m. of separation.

Case 27. aet. 40 about. dead 23½ hours.

Pregnancies	Labours	Symphysis pubis	Amt. of separation	Ext. diag. conj.	Bisiliac	Interspinous	Conjug. vera	Diag. conj. (int)	Brim: Transverse	Brim: Right Obl.	Brim: Left Obliq.	Intertrochic	Vertical height over Sym. pubis of Sacral prom.	& of Intersp. dtr.	True pelvis: Vertical depth of Post. wall	True pelvis: Side "	True pelvis: Ant. "	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
1	no record.	intact	.	15.	22.	20.65	9.1	11.45	12.8	11.9	12.1	27.7	8.7	5.7	10.	8.4	4.5	Site of symphy. pubis 6 M.M. to right Cartilage of " " quite unossified Amt. of spont. sepn. after div- ision 4 M.M. Left sup. sacroiliac. lig. yielded in usual site at 6 c.M. of sepn. and after that, that side moved most. This remedied in usual way.
		divided	7	17.7	23.4	25.	9.9	12.3	15.5	15.2	14.5	33.	10.	7.				

Case 26 aet. ? dead 26 hrs.

Pregnancies	Labours	Symphysis pubis	Amt. of pubic sepn.	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Diag. conj. (int.)	Brim: Transverse	Brim: Right Obliq.	Brim: Left Oblique	Intertroch.ic	Vertical height above Symphysis pubis of Sacral Promy.	and of Interspin. dr.	True pelvis: Vertical depth of Post. wall	True pelvis: Side "	True pelvis: Ant. "
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
no record.		intact	·	19.	26.	22.	12.5	14.1	13.3	13.	13.5	29.2	12.	7.7	14.	9.	4.5
		divided	8	19.5	27.7	26.1	13.8	15.2	16.5	15.8	16.4	33.4	12.9	10.5			

Site of Symph. pubis - median.
Cartilage of " " quite unossified
Amt. of spont. sepn.: 1 M.M.
No (yielding ?) tearing of ligament.

Case 25. aet. 18. dead 7 hrs.

Pregnancies	Labours	Symphysis pubis	Amount of separation.		Intercristal	Interspinous	Conjug. vera	Conjug. diag.	Transverse	Right obliq.	Left obliq.	Vertical ht above Sym. P. of Sacral Prom. + of Interspinous dt.						
					C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	Cartilage of symphysis pubis unossified.
0	.	intact	.	.	29.1	25.	11.5	14.5	14.	13.4	13.3	10.4	[illegible]	[illegible]	.	.	.	

Case 24. aet., 30? dead 20 hrs.

Pregnancies	Labours.	Symphysis Pubis	Amount of separation	(Ext.) diag conj.,	Intercristal	Interspinous	Conjug., vera	diag., conj., int.,	Transv., (Brim)	Right obl., (Brim)	Left obliq. (Brim)	Intertroch., ic	vertical height above Sym. pubis of Sacral Prom.y *	and of Interspin., dtr.	Vertical depth of Post., wall (True pelvis)	Side wall (True pelvis)	Ant., wall (True pelvis)	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
multipara.	no record.	intact	·	16.8	26.	22.2	10.8	12.5	14.2	12.8	13.	31.2	10.5	7.3	13.4	8.5	5.6	Site of sym., pubis median. Cartilage of " " unossified. Amt., of spont. sepn. nil. Ligaments did not rupture.
		divided	8	18.5	27.5	26.5	11.6	14.5	17.5	15.6	16.5	34.4	11.3	8.5				

* actual vertical height above Symphysis Pubis of Interspinous diameter is here and hereafter given.

Case 23 aet., 27. dead 24 hrs. about.

Pregnancies	Labours	Symphysis Pubis	Amount of separation	Ext., diag., conj.,	Bisiliac	Interspinous	Conjug., vera	diag., conj. (int.)	Transv. (Brim)	Right Obliq., (Brim)	Left Obliq. (Brim)	Intertroch., ic	Vertical hight above Sy. pubis of Sacral prom.	of Intersp., dtr.,	Vertical depth of Post., wall (True pelvis)	Side " (True pelvis)	Ant. wall (True pelvis)	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
0	0	intact	.	14·6	26·8	22·5	10·3	12·1	14·	12·6	12·8	30·	9·5	6·9	12·	9·	5·	Site of Sym. pubis median. Cartilage of " " quite unossified. Amount of spont. sepn. after division of Sym. pubis - nil. at 6 cm. left sup., sacroiliac ligt. ruptd. Periosteum raised off bone & stretched over front of joints. Death of Diabetes.
		divided	7	16·5	28·	26·7	11·1	13·2	17·4	15·1	16·1	33·5	10·	8·8				

Case 22. aet., 23. dead 26 hours.

Pregnancies	Labours	Symphysis Pubis.	Amount of separation	Ext. diag. conj.	Intercristal	Interspinous	Conjug., vera	Diag. conj. int.	Brim: Transverse	Brim: Right obliq.,	Brim: Left obliq.,	Intertroch, ic	Vertical height above Sy. pubis of Sacral prom	+ height of Intersp, dtr.	Vertical depth of Post, wall	True pelvis: Side "	True pelvis: Ant. "		
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	
0	.	intact	-	15.	24.6	20.	10.	11.8	12.35	11.3	11.1	29.	9.4	7.2	11.1	8.6	4.5	11.9	Site of sym. pub. 7 m.m. to left. Cartilage of " " unossified. Amt. of spont. sepn. nil. At 6 c.m. of sepn. left ant. sacroiliac ligt. ruptured & left side moved most. rectified as in text.
		divided	8	15.5	25.5	24.2	11.	12.1	15.7	14.4	14.25	33.	9.8	9.2				13.5	

Case 21. aet. 26. dead 10 hrs.

Pregnancies	Labours	Symphysis Pubis	Amt. of sep^n.	Ext. diag. conj.	Intercristal	Interspinous	Conjug. vera	Conj. diag. int.	Brim: Transv.	Brim: Right obl.	Brim: Left oblig.	Intertroch^ic	Vertical Height above Sy. pubis of Sacral Prom.	& Height of Intersp. ditto	Intercristal	Vertical depth of Post. wall (True pelvis)	Side " (True pelvis)	Ant. " (True pelvis)	
			C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	Site of Sy. Pubis 5 M.M. to left.
0	0	intact	.	16·5	26·1	24·6	11·1	12·8	13·3	13·	12·9	31·3	10·2	7·	11·	12·9	8·5	4·5	Cartilage of " " quite unossified. Amt. of spont. sep^n. none
		divided	8	17·2	27·5	28·8	12·25	14·3	17·	16·	15·7	35·	11·3	10·1	13·				Sep^n. of pubes very difficult as she was an old nullipara. At 3 cm. of sep^n. right sacroiliac lig ruptured a little at usual site. At 8 c.m. left also in same place. Periosteum raised off bone.

Case 20. P.M. 1.p.m. 15.1.00.

No of children	No. of miscarriages	Labours	Symphy. pubis	Amt. of sepⁿ.	Ext. diag. conj.	Bisiliac	Interspinous	Conjug. vera	Int. diag. conj.	Brim: Transverse	Brim: Right obliq.	Brim: Left obliq.	Intertroch, ic	Height above Sym. Pubis Sacral Promʸ.	and of Intersp. dtr.	& of Intercristal	True pelvis: Vertical depth of Post. wall	True pelvis: Side wall	True pelvis: Ant. wall
				C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.	C.M.
multiparous. large family	no record.	"	intact	.	19.3	27.9	24.9	12.9	15.1	14.	14.	13.1	30.2	12.1	8.2	12.2	14	9.	5.
			divided	2	19.5	28.1	26.	13.15	15.5	14.6	14.6	14.1	32.	12.5	8.8	12.6			
				4	19.7	28.9	27.	13.5	15.7	15.5	15.5	14.8	32.9	12.7	9.5	13.1			
				6	20.6	29.1	27.9	14.45	15.85	16.45	18.45	15.5	34.	12.8	10.	13.8			
				8	20.7	29.5	28.6	14.6	16.	17.5	17.5	16.5	35.3	13.3	10.4	14.5			

Site of Sym. pubis - central.
Ossificⁿ. of cartilage none.
Amt of spont. sepⁿ. 7 M.M.
At 4 cm. of sepⁿ. left sacroiliac ligᵗ. tore in usual site, and left side began to take on most movement, rectified by method described in text.
At 8 cm. both yielded at same usual point.

Table A.

Diameter Conjugata vera

case	Natural length. Symphysis intact	Increase with a separation of 1 c.m.	2 cm.	3 cm.	4 cm.	5 cm.	6 cm.	7 cm.	8 cm.	Average increase per c.m. of pubic sep.
1	11·3	·05	·1	·2	·25	·3	·4			·066
2	8·6	·05	·1	·2	·3	·4	·6	·8		·114
3	12·	·2	·6	1·1	1·2	1·3	1·6			·266
4	11·25	·25	·35	·85	1·05	1·1	1·5	1·85		·264
5	12·5				1·0					·250
7	10·7			·55						·183
8	10·3	·1	·5	·7	·9	1·0				·200
9	13·9	·1	·4	·6	1·3	1·4				·280
10	10·5	·1	·3	·5	·9	1·5				·3
11	11·5	·05	·1	·2	·4	·5				·1
12	14·5	·1	·3	·5						·166
13	10·4	·1	·5	·7	·8					·2
14	11·1							1·5		·214
15	10·5	·05	·1	·15	·2	·3		·6		·085
16	10·5	·							·5	·062
17	12·3								1·3	·162
18	10·3								1·5	·187
19	11·25									·
20	12·9	·	·25	·	·6	·	1·55	·	1·7	·212
21	11·1								1·15	·143
22	10·								1·	·125
23	10·3							·8		·114
24	10·8								·8	·1
25	11·5									
26	12·5								1·3	·162
27	9·1							8		·114
28	12·						1·			·166
29	12·4							·9		·128
average	11·28	·104	·3	·52	·741	·866	1·1	1·035	1·031	·167

Table B.

Sacral Promontory.

	Symphysis intact.	Vertical height above upper edge of symphysis pubis with symphysis divided & separated 1 c.m.	2 c.m.	3 c.m	4 c.m.	5 c.m	6 c.m.	7 c.m	8 c.m	average increase per c.m. of separation
1	10·5									
2	7·5									
3	11									
4	10·4	·8	1·	1·	1·2	1·2	1·9	2·		·285
5	11·2	·3	·8	1·3	1·8					·450
7	9·3	·7	·9	1·2	1·2	1·3				·260
8	10·	·0	·2	·6	·6	·7				·140
9	12·	·2	·5	·6	·7	·8				·160
10	9·5	·2	·5	·6	·8	·9				·180
11	9·8	·3	·5	·7	·9	1·2				·240
12	13·5	·4	·5	·8						·266
13	9·2	·2	·3	·5	·7					·175
14	10·							·6		·085
15	9·2	·1	·2	·3	·35	·4		·7		·1
16	9·								1·	
17	11·								1·	
18	9·7								·5	
19	10									
20	12·1		·4		·6		·7		1·2	·15
21	10·2								1·1	·137
22	9·4								·4	·05
23	9·5							·5		
24	10·5								·8	·1
25	10·4									
26	12·			-					·9	·112
27	8·7							1·3		·185
28	10·7						1·3			·216
29	11·5							·8		·114
averages	10·24 of 28 cases.	·32 of 10 cases	·52 of 11 cases	·76 of 10 cases	·885 of 10 cases	·92 of 7 cases	1·3 of 3 cases	·96 of 6 cases	·86 of 8 cases	·164 of 23 cases

Table C.

Case	Site of Symphysis Pubis: To Left of median	Median	To Right	when yielded	Anterior and Superior sacro-iliac ligament where yielded	Left	Right	On section of Symphy. pubis: amt. of spont. sep.	State of cartilage
2				C.M. 5	at a point bet. the bones just superior to the salient angles		×		quite unossified
3				5 6	"	×	×		" "
4				4	"	×			" "
5		×		4	"		×		" "
6		×			"				" "
7	6 M.M			3	"	×		1·1 C.M.	" "
8		×		4	"	×		1 M.M.	" "
9		×		0	"	0	0	2 M.M	" "
10	4 M.M.			3 4	"	×	×	3 M.M.	" "
11			7 M.M.	8	"		×	7 M.M.	" "
12	6 M.M.			3	"		×	0	" "
13	6 M.M.			0	"	0	0	0	" "
14			1 C.M.	0	"	0	0	3 M.M.	" "
15			8 M.M	8	"	×		4 M.M.	" "
16		×		0	"	0	0	2 M.M.	" "
17		×		8	"	×		2 M.M	" "
18	5 M.M.			7	"	×		1 M.M	" "
19	4·5 M.M.			.	"	.	.	2 M.M	" "
20		×		8	"	×	×	7 M.M	" "
21	5 M.M.			3 8	"	×	×	0.	" "
22	7 M.M.			6	"	×		0.	" "
23		×		6	"	×		0.	" "
24		×		0	"	0	0	0	" "
25	.	.		.	.			.	
26		×		0	"	0	0	1 M.M.	" "
27			6 M.M.	6	"	×		4 M.M.	" "
28		×		3	"		×	5 M.M	" "
29		×		3	" "	×		1 M.M.	" "

Table D

A.

Interspinous diameter

	Symphy. intact.	Height above Symphysis Pubis with a separation of symphysis pubis of 1 c.m.	2 c.m	3 c.m.	4 c.m.	5 c.m.	6 c.m.	7 c.m.	8 c.m.
1	8.								
2	7.								
3	9·2								
4	9·5	9·8	9·9	9·95	10·5	11·2	11·8	11·8	
5	9·3	10·1	10·2	10·6	10·8				
7	8·2	9.	9·6	10.	10.	10·2			
8	7.	7·2	7·5	8.	8·3	8·6			
9	8.	8·5	8·7	9·4	9·7	10·2			
10	9.	9·5	9·7	9·8	10·2	10·3			
11	6·5	7·4	8·2	8·7	9.	9·5			
12	9·1	9·3	9·4	10.					
13	7·3	7·4	7·5	7·7	8·2				
14	7·3	.	.	.	.	.	.	9.	
15	7·2	7·3	7·4	7·5	7·8	7·85	.	9.	
16	8·9								11·3
17	7·9								10·5
18	7·1								8·7
19	7·4								
20	8·2	.	8·8	.	9·5	.	10		10·4
21	7.								10·1
22	7·2								9·2
23	6·9							8·8	

B.

Vertical height above Symphysis Pubis

	Symphysis intact	with a separation of the Pubes of 1 c.m.	2 c.m.	3 c.m.	4 c.m	5 cm	6 c.m.	7 c.m.	8 c.m.
24	7·3								8·5
25	7·1								
26	7·7								10·5
24	8·7							10.	
28	6·4						8·8		
29	7·4							8·3	

Table F

Conjugata diagonalis (internal)

	Length in the natural state	Measurement with a separation of 1 c.m.	2 c.m.	3 c.m.	4 c.m.	5 c.m.	6 c.m.	7 c.m.	8 c.m.	average increase for 1 c.m. of pubic separation
1	13·	13·2	13·5·	13·6	13·7	13·75·	13·8			·126
2	11·	11·4	12·	12·2	12·5·	13·	13·1	13·5·		·357
3	13·1	13·3	13·9	14·	14·1	14·15·	14·5·			·233
4	12·6	12·9	12·95·	13·5·	13·65·	13·65·	13·7	14·1		·214
5·	13·9				14·9					·23·
6	12·1			12·2						·633
8	11·5·	11·9	11·95·	12·05·	12·1	13·				·3
9	14·9	15·	15·1	15·6	15·65·	15·7				·16
10	12·2	12·4	12·5·	13·	13·2	13·3				·22
11	12·2	12·9	13·	13·1	13·2	13·3				·22
12	16·3	16·45·	16·8	16·85·						·183
13	12·8	13·	13·4	13·5·	13·55·					·187
14	13·							13·9		·128
15	12·2	12·7	12·9	13·	13·1	13·3		13·5·		·185·
16	12·4								13·9	·187
17	14·5·								15·3	·1·
18	12·5·								13·9	·175·
19	12·95									
20	15·1		15·5·		15·7		15·85·		16·	·112
21	12·8								14·3	·187
22	11·8								12·1	·037
23	12·1							13·2		·157
24	12·5·								14·5·	·25
25·	14·8·									
26	14·1								15·2	·137
27	11·45·							12·3		·122
28	14·						16·			·329
29	18·							16·4		·2

average of conjugata diagonalis 13·08 c.m. in 28 cases.
" increase " " " 1·84 M.M. per c.m. of pubic separation.

Table H

Intertrochanteric diameter

	Length in the natural state	Measurement with a separation of the pubes of								average incr. per c.m. of pubic sep.
		1 c.m.	2 c.m.	3 c.m.	4 c.m.	5 c.m.	6 c.m.	7 c.m.	8 c.m.	
1	26.	26.9	27.8	28.5	29.4	30.3	31.2			.86
2	31.		32.4	32.5	32.9	33.5	34.	34.1		.44
3	27.9	28.8	29.4	29.8	30.3	30.8	31.5			.6
4		rheumatoid arthritis prevented measurement								
5	293	30.2	31.2	31.8	32.2					.725
7		excessive adiposity					"		"	
8	27.1	28.	28.6	29.1	30.4	31.4				.86
9	29.9	30.6	31.2	31.3	32.	32.5				.52
10	29.6	30.5	31.	31.5	32.1	32.5				.58
11	26.6	27.5	27.6	28.4	29.2	30.				.68
12	32.5	33.2	34.1	34.8						.76
13	27.3	28.2	29.	29.2	30					.675
14	26.5							30.5		.57
16	28.4								29.8	.14
17	30.								34.	.5
18	23.6								30.8	.9
19	28.6									
20	30.2		32.		32.9		34		35.3	.637
21	31.3								35.	.46
22	29								33	.5
23	30							33.5		.5
24	31.2								34.4	.4
26	292								33.4	.525
27	27.7							33.		.75
28	28.5						32			.583
29	28.4							33.6		.742

In 24 cases average length of intertroch. diameter was 28.74 c.m.

In 23 cases average increase per c.m. of pubic separation was 6.06 M.M.

Table I.

Diameter Inter-cristal or Bisiliac.

	Length in Natural state.	Measurement with a separation of the pubes of 1 c.m.	2 c.m.	3 c.m.	4 c.m.	5 c.m.	6 c.m.	7 c.m.	8 c.m.	average incr. per c.m. of pubic sep.n
1	26·	26·5	27·	27·9	28·	28·2	28·9			·48
2	28·	28·2	28·5	28·8	29	29·1	29·2	29·3		·18
3	23·6	24·2	25·	25·2	25·4	25·6	25·9			·38
4	24·9	25·3	25·5	25·8	25·95	26·05	26·1	26·5		·22
5	24·9	25·	25·2	25·6	25·7					·2
7	27·05	27·05	27·1	27·1						
8	26·2	26·5	26·9	27·2	27·5	27·9				·34
9	25·9	26·2	26·3	26·5	26·8	27·				·22
10	27·7	28·	28·2	28·5	28·6	29·1				·28
11	24·1	24·8	24·9	25·	25·2	25·4				·26
12	26·85	27·	27·25	27·25						·13
13	24·3	24·8	25·4	25·6	25·7					·35
14	23·5							25·		·21
15	25·5	25·8	26·	26·2	26·3	26·5		26·6		·15
16	24·2								24·9	·08
17	30·5								33	·31
18	24·4								27·7	·41
19	24·3									
20	27·9		28·1		28·9		29·1		29·5	·2
21	26·1								27·5	·17
22	24·6								25·5	·11
23	26·85							28·		·16
24	26·								27·5	·19
25	29·1									
26	26								27·7	·21
27	22							23·4		·2
28	25·4						26·4			·2
29	24·4							26·6		·2

average length in 28 cases 25·723 c.m.

" increase per c.m. of pubic sep.n 2·4 M.M.

Table K.

Interspinous diameter.

	Length in the natural state	measurement with a separation of the pubes of 1 c.m.	2 c.m.	3 cm	4 cm.	5 c.m.	6 c.m.	7 c.m	8 c.m.	average incr. per c.m. of pubic separation
1	21.	21·1	22·	22·3	22·6	22·9	31.			1·66
2	24·6	25·	25·3	25·5	25·6	27.	27·9	28·		·48
3	20·3	21·2	21·8	22·	22·55	23·2	23·8			·58
4	23·8	23·9	24·1	24·5	24·9	25·3	25·6	26·1		·32
5	21·9	22·2	23·	23·2	23·8					·475
7	22·8	23·5	23·8	24·3	·					·5
8	23·8	24·4	24·9	25·4	26·4	26·9				·62
9	23·5	24·	25·	25·3	25·8	26·4				·58
10	24·4	25·	25·3	26·	26·8	27·6				·64
11	22·2	22·65	22·9	23·5	23·9	24·4				·44
12	24·8	25·	25·5	26·05						·41
13	21·4	21·9	22·3	22·9	23·5					·525
14	20·5							24·9		·628
15	23·5	23·8	24·2	24·7	25·1	25·5		26·3		·4
16	20·9								23·5	·325
17	28								32·2	·525
18	21·1								26·4	·662
19	19·5									
20	24·9		26·		27.		27·9		28·6	·462
21	24·6								28·8	·525
22	20·								24·2	·525
23	22·5							26·7		·525
24	22·2								26·5	·537
25	25·									
26	22·								26·1	·572
27	20·65							25·		·621
28	23·						26·1			·516
29	18·4							22·6		·6

In 28 cases average length 22·554 c.m.,
" 26 " " increase per c.m. of
pubic separation 5·61 M.M.

Table L.

Transverse diameter of Brim.

	Length in the natural state	measurement with a separation of the pubes of 1 c.m.	2 c.m.	3 c.m.	4 c.m.	5 c.m.	6 c.m.	7 c.m.	8 c.m.	av. incr. per c.m. of pubic separation
1	12·1	12·8	13·2	13·5"	13·6	13·7	14·1			·33
2	13·2	14·	14·5"	14·8	15·5"	15·8	16·	16·2		·428
3	12·5"	13·	13·6	13·9	14·2	15·	15·5"			·5"
4	14·7	15"3	15·6	15·9	16·2	16·7	17	17·4		·385"
5	13·35"	13·6	14·1	14·7	14·9					·13
7	14·5	14·55"	14·65"	15·2						·23
8	12·35"	12·8	13·3	13·8	14·3	14·9				·31
9	13·35"	13·9	14·15"	14·5"	15·1	16·1				·55"
10	14·4	14·5"	14·8	15"	15·6	16·				·32
11	14·1	14·65"	15"	15·3	15·7	16·1				·4
12	14·2	143	14·6	15"						·26
13	13·25"	13·8	14·1	14·4	14·8					·387
14	13·5"							14·9		·2
15"	13·5"	13·9	14·3	14·6	14·95"	15·4		15·9		·342
16	13·1								15"	·237
17	14·5"								18·1	·45"
18	12·								15·7	·462
19	12·6		14·6		15·2		16·45"		*	
20	14		14·6		15·5"		16·45		17·5"	·437
21	13·3								17·	·462
22	12·35"								15·7	·418
23	14·							17·4		·485"
24	14·2								17·5"	·412
25	14·									
26	13·3								16·5"	·4
27	12·8							15·5"		·385"
28	13·5"						15·1			·266
29	12·8							15·9		·442

In 28 cases average length 13·05 c.m.
" 26 " " increase per c.m. of pubic separation 4·01 M.M.

Table N.

Diameter — Diagonalis dextra (Brim.)

	Length in the natural state	measurement with a separation of the pubes of 1 c.m.	2 c.m	3 c.m.	4 c.m.	5 c.m.	6 c.m.	7 c.m.	8 c.m.	average increase per c.m. of pubic Sep:
1	12·5	12·8	13·	13·2	13·8	13·9	14·			·25
2	12·5	13·2	13·4	13·5	13·8	14·	14·8	15·3		·4
3	12·1	13·	13·2	13·35	13·5	14·	14·8			·45
4	13·1	14·	14·15	14·85	15·2	15·85	15·9	16·1		·42
5	12·9	13·15	13·5	13·9	14·1					·3
7	13·9	14·2	14·4	14·5						·2
8	12·	12·5	12·95	13·6	13·7	13·9				·38
9	13·5	13·6	13·9	14·1	14·55	14·55				·2
10	13·4	13·9	14·05	14·2	14·6	15·1				·34
11	12·8	13·2	13·4	14·	14·4	15·1				·46
12	14·	14·3	14·75	15·2						1·
13	12·	12·4	13·	13·5	14·3					·575
14	12·1							14·9		·4
15	12·9	13·1	13·3	13·4	13·7	14·		14·2		·18
16	12·								14·4	·3
17	14								17·2	·4
18	11·5								14·7	·4
19	12·5									
20	14·		14·6		15·5		16·45		17·5	·43
21	13·								16·	·34
22	11·3								14·4	·38
23	12·6							15·1		·35
24	12·8								15·6	·35
25	13·4									
26	13·								15·8	·35
27	11·9							15·2		·47
28	12·2						13·4			·25
29	12·8							15·6		·4

In 28 cases average length 12·7 c.m.
" 26 " " increase per c.m.
of pubic separation 3·84 c.m.

Table O

Diameter — Diagonalis laeva (Brini)

	Length in the natural stak.	Measurement with a separation of the pubes of 1 c.m.	2 c.m.	3 c.m.	4 c.m.	5 c.m.	6 c.m.	7 c.m.	8 c.m.		average increase per c.m. of pubic Sep.ⁿ
1	11	12·	12·5	13	13·3	13·5	13·8				·446
2	11·5	12·2	12·5	12·9	13·2	14·1	14·2	14·4			·41
3	12·	12·7	13·	13·3	13·55	13·9	14·5				·41
4	14·	14·15	14·9	14·9	14·95	15·35	15·5	15·7			·54
5	12·85	13·1	13·5	14·2	14·6						·43
6	13·15	14·1	14·3	14·3							·38
8	12·	12·3	12·6	13·	13·5	14·2					·44
9	13·	13·2	13·3	13·9	14·4	15·1					·42
10	13·	13·3	13·6	14·	14·6	14·9					·38
11	13·6	13·9	14·	14·4	15·	15·1		14·4			·3
12	14·	14·3	14·75	15·3				14·2			·43
13	10·8	11·2	11·3	11·9	12·8				15·		·5
14	12							14·1	16·		·3
15	12·9	13·	13·1	13·2		14·		14·2	15·1		·18
16	12·4								15·		·325
17	13·5								16·		·31
18	11·5								15·1		·45
19	12·5										
20	13·1		14·1		14·5		15·5		16·5		·425
21	12·9								15·7		·35
22	11·1								14·25		·39
23	12·8							16·1			·47
24	13·								16·5		·43
25	13·3										
26	13·5								16·4		·36
27	12·1							14·5			·34
28	11·5						13·6				·35
29	12·8							15·1			·32

In 28 cases average length 12·56 c.m.
" 26 " " increase per c.m.
of pubic separation 3·9 M.M.