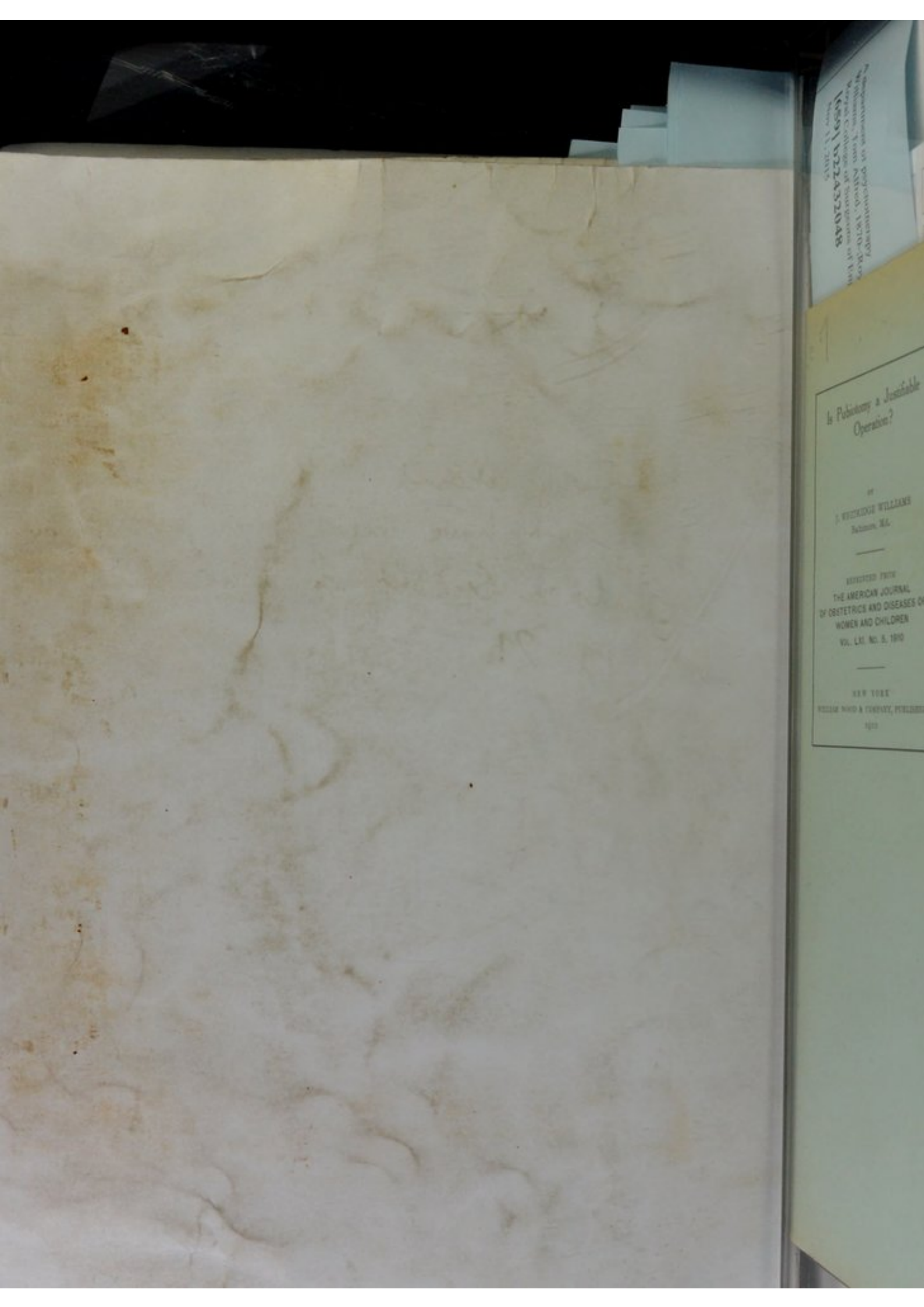
**Is pubiotomy a justifiable operation? : [second communication based upon a series of twenty-five successful cases] / by J. Whitridge Williams.**



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# Is Pubiotomy a Justifiable Operation?

BY

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# IS PUBIOTOMY A JUSTIFIABLE OPERATION.*

## Second Communication Based upon a Series of Twenty-Five Successful Cases.

BY

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In a report made to the American Gynecological Society in May, 1908, based upon thirteen successful operations, I held that pubiotomy had a distinct field of usefulness under certain definite conditions. Since that time twelve additional operations have been performed in my service, making a total of twenty-five. Moreover, seven of the women who had been subjected to pubiotomy have been delivered subsequently, and I have been able to reexamine twenty-two of the patients at periods of from three months to three years afterward.

On this occasion I shall consider in the first place the immediate results of the operation both for the mother and child, and then take up its remote effects upon the general health and industrial efficiency of the former, as well as its influence upon the course of subsequent pregnancy and labor. I shall then review the recent literature upon the subject, and finally consider the technique and indication for the operation, as developed by my own experience and literary studies.†

*Immediate Results:*—In the twelve cases here reported there were no maternal or fetal deaths, so that in the entire series of twenty-five operations all of the mothers and twenty-two of the

* Read before the American Gynecological Society, May 3, 1910.
† Histories at the end of the article.

children were saved, and it may be added that the death of only one of the latter could be attributed to the operation; namely, case V of the previous series.

On analyzing the histories of the twenty-five operations, one finds that twelve of the patients were primiparous and thirteen multiparous, while nine were white and sixteen black. Moreover, the accompanying table shows the incidence of the several varieties of contracted pelvis and their partition between the two races.

| Type of pelvis | Total number | In 9 white women | In 16 black women |
|---|---|---|---|
| Generally contracted rhachitic | 14 | 2 | 12 |
| Generally contracted funnel | 3 | 2 | 1 |
| Generally contracted | 1 | ..... | 1 |
| Simple flat | 3 | 3 | ..... |
| Flat rhachitic | 2 | ..... | 2 |
| Typical funnel | 2 | 2 | ..... |
| | 25 | 9 | 16 |

It thus appears that rhachitic pelves were noted in only two of the nine white patients, as compared with fourteen of the sixteen black patients, an incidence of 22 and 75 per cent. respectively. In twenty cases presenting the usual types of pelvic deformity the conjugata vera varied from 7 to 8.75 cm.; whereas in the five generally contracted and typical funnel pelves the distance between the tubera ischii measured 7 to 7.75 cm.

In the entire series there were one transverse, four breech, and twenty vertex presentations. In the latter category the positions noted were as follows: L. O. A., three; L. O. T., six; R. O. T., six; and R. O. P., five; thus indicating that in 55 per cent. of the cases the occiput was directed toward the right side. Moreover, the fact that anterior positions were noted in only 15 per cent. of the cases clearly emphasizes the effect of the pelvic abnormality upon the position of the head.

Ordinarily the operation was not undertaken until a long test of the second stage had demonstrated that nature was unable to overcome the disproportion between the size of the head and the pelvis, its average duration being three and one-half hours. In five cases, on the other hand, interference was effected earlier. Thus, in case XXI, in which the child presented transversely, the operation was undertaken one hour after complete dilata-

tion of the cervix and a large child readily delivered by version and extraction; while in cases VII, IX, XVII, and XVIII interference seemed indicated before the cervix had become completely dilated. In these cases the external os varied from 5 to 8 cm. in diameter and was dilated manually before undertaking the pubiotomy. In cases IX and XVII interference was called for by exhaustion on the part of the mother, as indicated by a rise in the pulse rate to 120 or more and a slight elevation in temperature. In case VII manual dilatation of the cervix and completion of labor seemed indicated on account of the prolapse of a foot and its protrusion from the vulva, while in case XVIII interference appears to have been unjustified. In this instance the multiparous patient had a generally contracted rhachitic pelvis with a diagonal conjugate of 9.75 cm. She had previously gone through several difficult labors, and, having lost the children, was most anxious for a live child. As her pulse became somewhat rapid, manual dilatation of the very soft cervix was undertaken when it had attained a diameter of 5 cm. This was readily accomplished, and a small child weighing 2,080 grams delivered after pubiotomy and an easy forceps operation. In this instance the operation was not justified, and was done under a misapprehension concerning the size of the child, which appeared much larger before delivery than afterward.

In all but the first case, in which the technique of Gigli was employed, the pubiotomy was done by Doederlein's subcutaneous method, and in every instance the child was delivered immediately after sawing the bone, for the reason that the operation had been deferred until demanded by the appearance of some indication for prompt delivery on the part of the mother or child, or until a prolonged second stage had shown that nature was unable to complete the task. Delivery was effected by forceps in eighteen, by breech extraction in four, by podalic version from head presentations in two, and by version from a transverse presentation in one case. Moreover, in the hope of preventing injury to the soft parts, the vaginal outlet was freely dilated with the hand before severing the pubic bone.

Serious hemorrhage was noted only in case V, which was complicated by a deep communicating vaginal tear following the breech extraction of a 4,050 gram child. The patient was put back to bed considerably shocked, but eventually made a satisfactory recovery.

Perineal tears were noted in three primiparæ and three mul-

tiparæ. In five instances they were slight, but in case V, already mentioned, the tear was deep; all were repaired immediately and healed by first intention. Communicating vaginal tears were noted in five instances, once in the first and four times in the present series. Three occurred in primiparæ and two in multiparæ, and with one exception were immediately repaired by sutures and healed without difficulty. All but one of the women so injured had fever, which was moderate in two and severe in two cases. Of the latter, case V was seriously ill, while case XXII had a temperature of 103.2, but, as intrauterine cultures showed the existence of gonorrheal infection, it could not necessarily be connected with the lesion.

As far as I can ascertain the method by which delivery is effected has only a slight influence in the production of such tears, as two of them complicated seven breech extractions, and three occurred during the course of eighteen forceps deliveries. Moreover, it would appear that in not a few instances the tear might have been avoided had the assistant, who performed the operation, made horizontal instead of upward traction while delivering the head through the vulva.

In no instance was the bladder injured, nor did the patients at any time pass bloody urine, while catheterization was necessary in only six cases. In three instances it was limited to the day of operation, while in only one of the remaining cases was it continued for more than a few days. With the exception of case V, none of the patients were seriously ill during the puerperium, and the majority apparently suffered but little. In many instances they turned spontaneously in bed the day after operation and were anxious to sit up at the expiration of a few days. Several got out of bed during the first week in the absence of a nurse, but sustained no injury from so doing. Ordinarily the patients were kept in bed for three weeks and discharged at the end of the fourth, although my experience seems to show that so long a rest in bed is not necessary and it will be shortened in the future.

During the puerperium fourteen of the twenty-five patients presented a temperature of 100.5 or over—56 per cent.—although with one exception none of them appeared seriously ill. Thus,

In five cases the temperature varied from 100.5 to 100.9.

In seven cases the temperature varied from 101 to 102.

In one case the temperature reached 102.5.

In one case the temperature reached 103.2.

In the last instance it is doubtful whether the fever should be

ascribed entirely to the operation, as gonococci were demonstrated in the uterine lochia. In all patients there was a certain amount of œdema about the vulva for the first few days following the operation, which, however, disappeared spontaneously. In cases I and IV quite a marked hematoma developed in the labium majus on the side of the operation, while in cases VII and XVII the convalescence was complicated by a mild phlebitis.

On discharge at the end of the fourth week the pubiotomy skin incision, as well as any tears which might have occurred during delivery, were found to be satisfactorily healed. Generally speaking, there was considerable thickening upon the anterior surface of the severed pubic bone, while no trace of the section could be felt posteriorly. On passive movement of the thigh definite motility at the site of section was elicited in sixteen out of the twenty-five patients, thus showing that healing had occurred by fibrous rather than by bony union. In only one instance, case I, was any injury sustained by the sacro-iliac joint, but gave rise to only transient trouble.

That the fibrous union had no effect upon locomotion was shown by the fact that all of the patients, except case XIX were able to walk without difficulty at the time of discharge. In this instance, however, the painful locomotion could hardly be ascribed to the operation, as the patient had suffered during pregnancy from such marked relaxation of the sacro-iliac joints that she was able to walk only when wearing a tight binder, while the condition has gradually improved since delivery. In all cases the condition of the internal genitalia was excellent, and retrodisplacement of the uterus was noted only in two instances.

*Remote Effects of the Operation Upon Patient.*—I have personally reexamined twenty-one out of the twenty-five patients of this series, and have heard by letter from two others, at periods varying from two months to three and a half years after the pubiotomy, and in every instance have found that they were well satisfied with its results. Indeed, after a lapse of several months, none of the patients complained of any untoward symptoms, except case XIX, who nine months after operation stated that she still had some difficulty in walking, although this was gradually improving, and this was the patient already mentioned who had suffered from relaxation of the sacro-iliac joints during pregnancy. All of the other women reported that they were able to walk as well and work quite as hard as previously,

and, indeed, several stated that they would be perfectly willing to submit to another operation should it become necessary.

My experience, however, seems to indicate that the immediate results are more satisfactory in slightly built than in heavy women, as nearly all of the rhachitic negresses stated that they suffered but very little; while some of the heavier white women reported that they had experienced some difficulty in locomotion for several months after leaving the hospital, which, however, eventually disappeared. In such cases they were able to walk reasonable distances without discomfort, but suffered more or less pain when greater distances were attempted, yet in no instance except case XIX did the symptoms persist longer than a few months.

It is interesting to note that in the majority of patients the upper skin wound, which originally lay above and parallel to the superior margin of the pubic bone, gradually changes its position, so that in the course of time its cicatrix occupies a position corresponding to the middle or even the lower margin of the bone, and, being completely covered by pubic hair, is often difficult to locate.

On reexamination no change was noted in the motility at the site of section, as the condition persisted in those women in whom it was present at the time of discharge, and did not appear in those in whom it was originally absent. As has already been indicated, definite motility was noted in two-thirds of the patients, and it would accordingly appear that if bony union is to occur it must develop during the weeks immediately following delivery, whereas if it has not been effected by that time fibrous union will persist.

Up to the present time the literature records autopsy findings in five patients upon whom pubiotomy had been performed one to four years previously. These were reported by Oberndorfer, Welponer and Cristofoletti (two cases), Reifferscheid and Mayer. In four the union was entirely fibrous, and in the case reported by Mayer the connective-tissue formation was so slight that the cut ends of the bone were merely united by a few shreds, the integrity of the pelvic girdle being maintained by the fibrous tissue which had developed upon the anterior and posterior surfaces of the bone. On the other hand, true bony union had occurred in one of the cases reported by Welponer and Cristofoletti, while an elevated bony ridge upon the posterior surface of the bone indicated the site of section and encroached slightly upon

the pelvic cavity. From these reports and my own experience it would therefore seem that fibrous healing is the rule and bony union the exception.

The findings at the site of the bone section, likewise, vary considerably according as the patient is examined within a few weeks or after a longer period. In the first instance there is usually considerable thickening upon the anterior surface of the pubic bone, while no trace of the incision can be felt upon its posterior surface. On the other hand, a subsequent examination will frequently show that the anterior thickening has disappeared, while the site of the incision on the posterior surface may be indicated by a shallow depression, which sometimes terminates by a slight notch at its superior and inferior extremity. Only once in our series of cases could definite separation between the ends of the bone be detected on palpation (case XXIV), but in this instance a shallow groove 1 cm. in width lay between them, and buckled slightly upon passive movement of the thigh.

*Effect Upon the Pelvis.*—Upon reexamination all of my patients were subjected to careful mensuration for the purpose of determining what effect, if any, the operation had exerted upon the size of the pelvis. Changes were noted in eleven instances: cases II, VI, VII, XI, XV, XVI, XVII, XVIII, XIX, XXIII, and XIV. In several they were so slight that it was questionable whether they were due to actual enlargement or merely to some slight error in pelvimetry. In others, on the contrary, the changes were so pronounced that there could be no doubt as to their significance. In eight patients the distance between the tubera ischii had undoubtedly become increased following the operation. This varied from 1 to 2 1/2 cm., and in several instances, as will be pointed out later, apparently led to sufficient enlargement to make possible the spontaneous ending of subsequent labors. The increase in the diagonal conjugate was less marked, but in five patients the measurement was 0.5 to 1.25 cm. longer than previously, while in two it was also associated with an increase in the distance between the tubera ischii.

These findings are of considerable interest, as they appear to indicate that permanent enlargement of the pelvis may occur in something less than one-half of the cases, and is more pronounced in the transverse diameter of the outlet than at the superior strait. Moreover, to a certain extent, they appear to be contradictory of the statement of Mayer, who holds that the practical

effect of pubiotomy is to accentuate the funnel shape of the pelvis, as a result of rotation of the innominate bones about a horizontal axis, whereby the area of the superior strait becomes absolutely increased and that of the inferior strait relatively decreased. However this may be, the fact remains that the distance between the tubera ischii is frequently increased, which would appear to indicate that pubiotomy is especially adapted to the treatment of dystocia due to contractions of the pelvic outlet.

*Effect Upon Labor.*—Of the fifteen patients operated upon prior to January 1, 1909, six have subsequently become pregnant once and one twice, and I shall give a brief abstract of the history of each case in order to determine if possible the effect of the operation upon the course of subsequent labors

CASE II.—Generally contracted funnel pelvis; C. D., 10 cm.; tubers, 7 cm.; pubiotomy child weighed 2,660 grams. The first subsequent pregnancy terminated prematurely at the seventh month, while the second ended spontaneously with the birth of a child weighing 3,640 grams. Mensuration showed that the tubera ischii were 1 cm. wider apart than before operation, while the child was 980 grams heavier.

CASE IV.—Flat rhachitic pelvis; C. D., 8 1/2 cm. The pubiotomy child weighed 3,230 grams. The subsequent labor was spontaneous, and the child weighed 3,100 grams; no change in pelvic measurements.

CASE V.—Generally contracted rhachitic pelvis; C. D., 9.75 cm. The pubiotomy child weighed 4,050 grams, while in the subsequent labor a child weighing 2,500 grams was delivered by Cesarean section. Examination showed no change in the pelvic measurements.

CASE VI.—Generally contracted rhachitic pelvis; C.D., 9.5 cm. The pubiotomy child weighed 3,230 grams, while the subsequent child delivered by Cesarean section weighed 3,430 grams. The previous operation led to marked changes in the pelvic dimensions which will be considered below.

CASE VII.—Generally contracted rhachitic pelvis; C. D., 8.75 cm. The pubiotomy child weighed 3,040 grams, while the subsequent labor was ended by a repeated pubiotomy (case XV of this series), although the child weighed only 2,110 grams, the pelvic measurements showed an increase of 1.25 cm. in the distance between the tubera ischii.

CASE IX.—Flat rhachitic pelvis; C. D., 10.5 cm. Unfortunately the weight of the pubiotomy child was lost, but the subsequent labor ended spontaneously with the birth of a 3,400 gram child, although no change had occurred in the pelvic measurements.

CASE XII.—Funnel pelvis; tubers, 7 cm. The pubiotomy

and subsequent child weighed 3,275 and 3,850 grams, respectively. It seems that the spontaneous delivery of the latter, which was 575 grams heavier than the first child, was probably due to an increase of 1 cm. in the distance between the tubera ischii.

From the data just adduced, it would appear that in two instances the subsequent pregnancy was terminated by Cesarean section, in one by a repeated pubiotomy, in four by spontaneous labor at term, and in one by spontaneous premature labor. Naturally it is difficult to determine whether the pubiotomy played any part in the spontaneous outcome in the four patients who were delivered naturally at term. In two of them, namely, cases II and XII, the children born spontaneously were, respectively, 980 and 575 grams heavier than those delivered by pubiotomy. In the first instance the pelvis was of the generally contracted funnel type and in the second of the typical funnel variety, and in each the operation was followed by an increase in the distance between the tubera ischii, so that it might appear that the fortunate outcome was due to the enlargement following pubiotomy. Concerning the other two patients with spontaneous labor no definite statement can be made; as in case IV the second child was 130 grams lighter than the first, while in case IX the weight of the first child was not available for comparison, but in neither instance did the pelvic measurements show any enlargement.

Cases VI of former and XXVI of present article give some idea of the difficulty of formulating a prognosis in this regard. The patient had a generally contracted rhachitic pelvis with a diagonal conjugate of 9.5 cm. Her first labor was terminated by the delivery of a 3,230 gram child after pubiotomy, and the head presented a deep depression over the left parietal bone where it had passed over the promontory of the sacrum. When she reentered the hospital in the latter part of her subsequent pregnancy no appreciable change could be detected in the pelvic measurements, although there was definite motility at the pubic section. In view of the fact that the pubiotomy delivery was very difficult and the present child seemed to be larger than the previous one, Cesarean section at the onset of labor seemed to offer the most conservative method of treatment. Accordingly, no further vaginal examinations were made, and the operation was performed as soon as possible after the onset of labor. Unfortunately, however, she died from an infection resulting from an error in technique.

The autopsy findings were most remarkable (case XXVI), and throw a new light upon the changes occurring in the pelvis during pregnancy subsequent to a pubiotomy which had healed by fibrous union. Upon removing the pelvis from the body and paring off the soft parts as well as possible, it was found that marked motility existed at the site of the bone section, and that the fibrous tissue uniting the ends of the bone had undergone such pronounced softening and stretching that it was possible to cause it to "buckle" by compressing the sides of the pelvis; while it permitted the ends of the bones to make a vertical excursion of 2.5 cm. when movement was imparted to the two sides of the pelvis. This condition was also associated with a considerable enlargement of the various pelvic measurements. Thus the conjugata vera was increased to 9 cm., while the distance between the anterior superior spines and crests of the ilium could be increased from 20 to 21 cm. and the length of the transverse diameter of the superior strait from 12 to 13 cm. accordingly as the cut ends of the bone were forced together or drawn apart. In the same way the transverse diameter of the outlet could be increased from 11 to 13 cm., although its antero-posterior diameter was not effected by passive movements.

An *x*-ray photograph likewise revealed an interesting condition in that it indicated that the innominate bones had undergone a certain amount of rotation about the sacrum so that the line of section, instead of the symphysis pubis, lay opposite the promontory of the sacrum. As a result the anterior portion of the right sacro-iliac joint was opened up, thereby increasing the length of the right oblique at the expense of the left oblique diameter of the superior strait.

These observations would appear to indicate that the relaxation incident to the hyperemia of pregnancy resulted in an enlargement of the pelvis sufficient to permit the occurrence of spontaneous labor, had nature not been forestalled by the Cesarean section. This possibility, however, was not considered, as the degree of motility observed *intra vitam* was not sufficiently pronounced to cause one to suspect the existence of the conditions found at autopsy. For further details concerning the anatomical findings in this case, the reader is referred to the detailed history at the end of the article.

In spite of the phenomenal relaxation, it is interesting to note that the patient walked perfectly well instead of suffering from the painful locomotion usually associated with relaxation at

the symphysis pubis or sacro-iliac joints. In such cases the pregnant woman is usually bed-ridden or can walk only when the ends of the bones are held together by a firm pelvic binder; and consequently the question arises as to whether the difference in location of the relaxation can explain the absence of symptoms: This must probably be answered in the affirmative, as the orthopedists inform me that a pseudoarthrosis following the fracture of a long bone is unattended by pain, whereas relaxation occurring in the neighborhood of a joint is usually associated with distressing symptoms, and it would seem that a similar explanation might apply in this instance.

That such a degree of relaxation cannot always be expected is shown by the fact that a second pubiotomy was necessary in the subsequent labor of case VII, although the child weighed 930 grams less than at the first labor. Moreover, the absence of enlargement of the pelvis in cases IV, V, and IX, on repeated mensuration, would point to a similar conclusion. At the same time the observation just recorded is of great interest, as it throws new light upon the extent of the enlargement which sometimes follows pubiotomy which has healed by fibrous union and then been subjected to the influence of the hyperemia incident to a repeated pregnancy, and likewise indicates that in such cases a conservative policy may well be followed, as it may possibly end in the spontaneous extrusion of a normal sized child.

The repeated pubiotomy recorded in case XV is also of very considerable interest. In this instance the first operation was done upon the left and the second upon the right side, with the idea that if it were repeated in the same location adhesions might be encountered which would complicate its course. The patient made an uninterrupted recovery and was able to walk and work perfectly satisfactorily, notwithstanding the fact that a movable segment had been interpolated in the anterior pelvic wall.

On looking over the literature, I find that repeated pubiotomies upon the same patient have been reported by Preller, Neu, Hoehne, Kupferberg, Reifferscheid, and Scheven. All of these operators, with the exception of Hoehne, did the second pubiotomy upon the opposite side to the first one, but the latter repeated it at the site of the previous section in the hope that he might secure a broader fibrous union, which would increase the possibility of greater relaxation in a subsequent pregnancy.

*Literature.*—Since the appearance of my article in 1908, the literature upon pubiotomy has been comparatively scanty. This is due in part to the great interest in the development of suprasymphyseal Cesarean section in Germany and its tentative employment by many authorities in place of pubiotomy.

Probably the most important contribution to the subject during this period is the article of Schläfli from Herff's clinic in Basel. This is based upon the study of 700 cases of pubiotomy reported in the literature, including eight of his own, and shows a maternal and a fetal mortality of 9.6 and 4.82 per cent., respectively, which after certain justifiable corrections may be reduced to 9.18 and 4.37 per cent. In view of this he considers, as the dangers to the mother are very considerable and the fate of the child so uncertain, that the operation should be employed only in the presence of some pressing necessity. For this reason he condemns prophylactic pubiotomy and urges that the procedure be resorted to only after nature has shown her absolute inability to lead the case to a successful issue. From his own experience he reports that six of his eight patients complained of considerable difficulty in walking, and four suffered from incontinence of urine for a long period following the operation.

From my point of view his statements do not seem to place the subject in a perfectly fair light; more especially as the 664 operations concerning which he was able to obtain more or less full details were performed by 142 operators. On analyzing his figures more closely, I find that sixty-four operators reported one operation, nineteen two operations, nineteen three operations, and six four operations each, making a total of 183 operations by 108 men; whereas the remaining 481 operations were performed by thirty-eight men. It therefore appears justifiable to assume that in the first group of cases the mortality would naturally be much higher than in the second, as it represents the casual results of the occasional operator instead of the matured experience of the trained man. That such a conclusion is justified is apparently shown by the discussion before the German Gynecological Society in 1907, when nineteen operators reported 319 pubiotomies with six deaths, a maternal mortality of 1.88 per cent.

Since that time the following series of operations have been reported:

Bumm, 1908, fifty-two pubiotomies with one death.

Hoehne, 1908, twenty pubiotomies with one death.

Schauta, 1908, thirty pubiotomies with no death.

Reifferscheid, 1909, thirty pubiotomies with one death.

Baisch (Doederlein), 1909, forty-two pubiotomies with one death.

Myself, twenty-five pubiotomies with no death.

Making a total of 199 cases with four deaths, a maternal mortality of 2 per cent., while the corresponding fetal mortality was approximately 4 per cent.—figures which I believe represent the results which may be obtained by competent operators in well-chosen material.

Bürger, in a monograph based upon the study of 5,288 cases of contracted pelvis occurring in Schauta's clinic during the previous fifteen years, speaks quite enthusiastically of the operation, and states that it should play a great part in doing away with craniotomy upon the living child. During this period the latter was necessary in seventy-six instances, and had pubiotomy been employed in the forty-five women who presented no signs of infection, the incidence of craniotomy upon the living child would have been reduced from 1.7 to 0.8 per cent. and the fetal mortality from 10.7 to 7.1 per cent.

Moreover, Baisch in a recent article states that the application of radical surgical procedures such as Cesarean section, supra-symphyseal Cesarean section, and pubiotomy, to the exclusion of the induction of premature labor and the so-called prophylactic and compromise operations, leads to a marked increase in the number of spontaneous labors occurring in large series of contracted pelvis cases and to a considerable diminution in the maternal mortality, as well as a lesser one on the part of the fetus, as is clearly shown by the following table:

| | Compromise operations Baumm, Fehling and Küstner | Compromise operations plus surgical procedures Leopold, Schauta, and Chrobak | Radical surgical procedures Pinard, Zweifel, Doederlein, and Bumm |
|---|---|---|---|
| Spontaneous labors.... | 50–60 per cent. | 70–75 per cent. | 80 per cent. |
| Maternal mortality.... | over 1 per cent. | about 1/2 per cent. | nearly 0 per cent. |
| Fetal mortality..... | over 10 per cent. | about 10 per cent. | Less than 10 per cent. |

Scheffzek, on the other hand, takes an opposite view and reports 1,011 contracted pelvis cases occurring in Baumm's clinic with 54 per cent. of spontaneous labors, including eighteen pubi-

otomies with two maternal and five fetal deaths. As a result of his experience, he holds that the dangers to the mother are too great to justify the continued employment of pubiotomy, as deep tears, injury to the bladder, and fatal infection are very liable to occur, while a patient who has once been subjected to the operation will not willingly submit to another. As his results with suprasymphyseal Cesarean section were no better, he believes that the induction of premature labor is the treatment par excellence in this class of cases.

The only French article upon the subject is that of Jeannin and Cathala which is based upon three successful cases from Bar's clinic. In noninfected cases they consider that pubiotomy gives no better results than Cesarean section, while it is much less dangerous in the presence of infection. At the same time they hold that its performance under such conditions markedly changes the results, as is shown by the tabulation of Rossier, who in 189 cases found that the maternal mortality was 17 and 2.9 per cent. respectively, according as the operation was done upon infected or upon uninfected women.

In this country Vorhees and Lobenstine have each reported one operation, and are quite prepared to give it a further trial, although the results in neither of their cases was ideal. On the other hand, C. B. Reed in an editorial in *Surgery, Gynecology and Obstetrics* for 1909, as well as in an article entitled "Pubiotomy, an operation for the general practitioner," takes an unduly optimistic view, as he states that it is a simple operation which can be safely performed by the general practitioner and constitutes the ideal procedure for the treatment of 75 per cent. of the cases complicated by contracted pelvis.

*Indications and Technique.*—My own experience as well as the results reported in the literature tend to show that when pubiotomy is properly performed under suitable indications upon uninfected women, the maternal mortality should not exceed 2 per cent., while approximately 95 per cent. of the children should be saved. As injuries to the bladder did not occur in any of my patients, and were noted but rarely in the statistics of those who employed Doederlein's operative technique, I feel that their occurrence should probably be attributed to the use of the purely subcutaneous method, to excessive separation of the ends of the bone, or to the employment of undue violence in delivering the child.

For these reasons such injuries may be considered as prevent-

able; while, on the other hand, it would appear that the chief dangers of the operation are hemorrhage, communicating vaginal tears, and infection, which cannot always be avoided. In only one of my cases was the hemorrhage alarming at the time of operation, and the entire literature records only two instances in which it led to a fatal issue; namely, those reported by Rosthorn and Raineri. Ordinarily the hemorrhage is venous in character; frequently it is very slight in amount and even when abundant usually yields to pressure. At the same time the occurrence of the two fatal cases shows that serious hemorrhage is a danger to be reckoned with, even though it occur but rarely.

Communicating vaginal tears have been noted in all series of the cases thus far reported, and appear to some extent at least to be unavoidable accompaniments of the operation, and to occupy relatively the same position as do extensive perineal tears in the usual obstetrical operations. Nevertheless, it appears that the frequency of their occurrence can be minimized by two precautions; namely, extensive manual dilatation of the vaginal outlet before commencing the operation, but more particularly by paying attention to the direction in which traction is made during forceps delivery. Under such circumstances, as the head emerges from the vulva, traction should be made almost horizontally, instead of upward and forward as in typical forceps operations. In several pubiotomies performed in my presence by my assistants, it has seemed to me that the injury might have been prevented had such a precaution been taken, and its importance was likewise recognized by Pfannenstiel.

As has already been indicated abnormal puerperia were noted in 55 per cent. of my cases. Only one patient was seriously ill, although another who had a gonorrheal infection presented a temperature of 103.2. Doubtless, a certain proportion of rises in temperature would have occurred had the labor been normal, or some simple operative procedure been undertaken. At the same time their incidence is too great to be attributed solely to the usual factors, and it must be admitted that there is something about pubiotomy which predisposes to infection. Possibly it is due to the unfavorable situation of the wound, and more particularly to the extensive opening up of connective tissue spaces. Nevertheless, it would seem that its frequency might be materially decreased by sharpening our aseptic precautions, as well by changing gloves or having some one who had not assisted directly at the delivery close the external pubiotomy

wounds, as by so doing certain possibilities for contamination might be eliminated.

I feel very strongly that a conjugata vera of 7 cm. should constitute the lowest limit of pelvic deformity in which the operation is permissible; for if it be exceeded the amount of gaping necessary to permit delivery of the child is so great as almost necessarily to lead to injury of the sacro-iliac joints, to which I am inclined to attribute a large part of the disturbances in locomotion reported by certain writers. Moreover, in my experience those patients have done best in whom the extent of gaping between the cut ends of the bone did not exceed 4 or, at most, 5 cm.

As already indicated, the pubiotomy in all my cases was followed by the immediate delivery of the child by forceps or version and extraction as the case might be. This was due to the fact that with a few exceptions I did not resort to the operation until a definite indication had arisen on the part of the mother or child, which seemed to call for the immediate termination of labor. Moreover, I consider that the great value of the operation lies in the fact that in "border-line" cases it enables one to observe an expectant attitude during the second stage and thus give nature every facility to overcome the disproportion, while at the same time it leaves the patient in such a condition that the operation may safely be undertaken if necessary. For this reason I am opposed to the so-called prophylactic operation and consequently have not waited for the spontaneous extrusion of the child after section of the bone.

Moreover, should conditions arise in a patient with a "border-line" pelvis which seem to indicate the necessity for prompt delivery while the cervix is still only partially dilated, I feel that the most satisfactory results will be obtained by completing the dilatation manually, placing the saw in position and then applying forceps tentatively, so that, in case the head fails to follow the first few gentle tractions, the bone may be sawed through and the resistance be overcome.

This prophylactic placing of the saw seems to me to have a comparatively wide field of application. It was done in case XXI preparatory to version from a transverse presentation, and the pubis was sawed through when it was found that extraction could not be effected without too great a risk to the child; while in case XXVI the saw was laid prophylactically but not used as the extraction of the child presenting by the breech was readily

effected. It would also seem a wise precaution in certain breech presentations when the size of the pelvis or of the child, or the history of past labors makes it probable that difficulty may be experienced in extraction. In such cases the prophylactic placing of the saw makes it possible for one to resort promptly to pubiotomy if necessary; whereas, if the saw is not laid until the indication for its use becomes imperative, the probabilities are that so much time will have elapsed between recognizing the necessity for interference and severing the bone that whatever chances the child had of living would have been sacrificed.

In my previous communication I stated my views concerning the relation of pubiotomy to the induction of premature labor and the performance of Cesarean section. At that time I held that it should practically supplant the former in "border-line" cases, whereas it should not be considered as entering into competition with the classical indications for the latter. I still hold the same views, and consider that it is inferior to Cesarean section upon uninfected women at the end of pregnancy, but is far superior to it when done after a prolonged test of the powers of nature in the second stage.

For this reason, when the conjugata vera measures 7 cm. or less or when the past history of the patient is such as to make it fairly probable that labor must be ended artificially in one way or another, I consider that the best and most conservative results will be obtained if primary Cesarean section is done at the end of pregnancy. Such a course was followed in the subsequent pregnancies of cases V and VI, and would have been in the subsequent labor of case VII had the patient been seen sufficiently early; but as she was not admitted until the time of election had already passed, she was allowed to go into the second stage, and a second pubiotomy was performed after nature had shown herself inefficient to overcome the disproportion.

During the past few years the development of suprasymphyseal Cesarean section in Germany by Franck, Sellheim, Doederlein, and Latzo have led to a considerable restriction in the performance of pubiotomy in its favor. Personally I am not prepared to express a decided opinion as to its merits, but theoretically I am inclined to believe that the extensive connective-tissue wounds necessarily associated with it will not lead to a marked improvement over the results following the classical operation. That such a belief is probably correct is shown by the recent statistics of Holzapfel, who reports a maternal mortality

of 8 per cent. in 162 suprasymphyseal Cesarean sections collected from the literature. This figure includes five deaths in fifteen eclamptic patients, but even after deducting them there were eight deaths in the 147 remaining operations, a net mortality of 5½ per cent., which is much greater than that of pubiotomy and approximately that of the classical Cesarean section. The future, however, can only decide whether the operation will have an extended field of employment or not, but I am prepared to let others make the experiment.

I might add that I do not consider pubiotomy an ideal surgical procedure, but for the present I feel that it is a valuable adjunct in the treatment of "border-line" cases of pelvic contraction, in that it enables one to subject the patient to a rigorous test of labor and then resort to operation without materially increasing her danger, and with every prospect of saving more than 90 per cent. of the children.

I feel very strongly that pubiotomy should always be considered a primary operation, and should not be performed after other unsuccessful attempts at delivery have been made, although an exception in this respect may be made in those cases in which the saw is placed prophylactically. Moreover, I believe that it should not be employed in definitely infected women, as under such circumstances the maternal mortality according to Rossier rises to such an extent as to make it unjustifiable—2.9 to 17 per cent. With such results it would seem unwise to subject the patient to so great a risk for the sake of saving a child whose chances are probably already compromised, and under such conditions I consider tentative forceps followed by craniotomy, if necessary, the preferable procedure.

## CASE HISTORIES.

(Continuing Cases I to XIII in AMER. JOUR. OBST., 1908, lviii, No. 2.)

CASE XIV.—No. 3484. Freyer, twenty-seven years old, III-para, and two miscarriages. All labors very slow, lasting two or three days and ended instrumentally. Generally contracted rhachitic pelvis, 24, 25.75, 30.5, 18 and 10.25 cm. Pubic arch fair, tubers 9 cm. Large child in L. S. A. frank breech. The first stage of labor lasted forty-seven hours, and in spite of good second-stage pains for two hours there was only slight engagement. At that time the uterus had become tetanically contracted, pulse 120, and temperature 99.6. In view of these conditions, the history of the previous labors

and the fact that the child seemed to be large, pubiotomy was decided upon.

June 6, 1908.—Left-sided pubiotomy. Considerable hemorrhage immediately after severing the bone, readily controlled by pressure. The bone wound gaped spontaneously for 1 cm. which increased to 4 cm. during extraction. As the tetanic condition of the uterus made it impossible to bring down a foot, typical frank breech extraction was readily effected without perineal or vaginal tear.

The convalescence was satisfactory and the patient suffered but little pain. She was placed on her side on the second day and the following day turned without assistance and was out of bed on the twentieth day. The highest temperature was 102.5 on the ninth day, which was apparently connected with some infiltration of the left labium majus.

Discharged on the thirtieth day in excellent condition. Definite motility at the bone incision; some thickening on the anterior surface, posterior surface perfectly smooth. Sacro-iliac joints negative, internal genitalia normal. Walks fairly well, but with a slight limp which she attributes to pain in the left hip.

The female child was born in excellent condition and weighed 3,310 grams at birth and 3,830 on discharge. Was suckled by mother. Head measurements at birth 12.5, 11.25, 9.5, 9, and 8 cm.

Further history not obtained, as a letter written January, 1910, was returned unanswered.

Case XV.—No. 3631. Roles, aged nineteen years. Same patient as case VII, upon whom pubiotomy was performed February 3, 1907. Generally contracted rhachitic assimilation pelvis, 23, 23, 27, 14.25, 8.5, and 7 cm. Pubic arch wide, tubers 11.75 cm. Was seen by the out-patient service, when the child which lay transversely was converted into R. O. T. by external maneuvres.

She was later sent into the hospital. After two and one-half hours of strong second-stage pains the head was still above the superior strait in the posterior parietal position and could not be impressed even under anesthesia.

September 18, 1908.—Right-sided pubiotomy, Dr. Storrs. Considerable bleeding, readily controlled by pressure. The child was turned and extracted without difficulty, the ends of the bone separating 5 cm. As the former pubiotomy had been on the left side, Dr. Storrs thought it simpler to do the second on the opposite side, so as to avoid any complications due to possible adhesions.

Typical recovery, the highest temperature being 100.4 the day of delivery. The patient turned spontaneously in bed on the fourth day, and had no complications except for slight separation of the skin wound. Catheterization not necessary. Was up on the eleventh, walked on the twenty-second, and was discharged on the thirtieth day. At that time no callus could

be felt on the posterior surface of the bone, but instead a slight depression indicated the line of section. Sacro-iliac joints normal. Definite motility of both the old and new pubiotomy wounds. Patient walked perfectly and complained of no pain. When seen some months later she reported that she had gone to a dance one month after leaving the hospital.

The child was born in excellent condition, but presented a distinct depression on the right parietal bone. Head measurements 12.5, 10.5, 9.5, 8.5, and 7 cm. Suckled by mother. Weighed 2,110 grams at birth and 2,390 grams at discharge.

CASE XVI.—No. 3780. Novitski. Aged thirty-two, VII para, two children still-born, the others born alive spontaneously after prolonged labors. The last labor was ended by version on account of prolapsed extremities. Simple flat pelvis, 27.5, 29.5, 33.5, 18, and 10.5 cm. Pubic arch wide, tubers 12 cm. Child presented in R. O. P. First stage of labor rapid, cervix becoming completely dilated in four hours. As engagement did not occur after four hours of rather ineffectual second-stage pains, pubiotomy was determined upon.

January 6, 1909.—Left-sided pubiotomy. The child was readily delivered after version and extraction. Placenta followed immediately after its delivery. Unfortunately no note was made as to the amount of separation of the pubic bones. No vaginal or perineal tear.

Convalescence typical, highest temperature 100.5 on the fourth day; catheterization not necessary. Did not complain of pain and stood up on the fourteenth day and walked perfectly well at the end of three weeks. On discharge there was a certain amount of induration on the anterior surface of the pubic bone, but not on the posterior, where the site of incision was indicated by a slight depression, whose ends were indicated by shallow notches on the upper and lower margin of the bone. Definite motility on passive movements; sacro-iliac joints normal; patient walks readily and without pain. Internal genitalia negative. Pelvic mensuration showed that the diagonal conjugate had increased 1 cm. and the transverse of outlet 1 1/2 cm.

The child was born in good condition, weighed 2,990 grams at birth and 3,690 on discharge and presented the following head measurements: 13, 11.75, 9.5, 8.75, and 8.25 cm. Suckled by mother.

January 27, 1901.—The patient returned for examination, and stated that she was able to walk as well and work as hard as at any time of her life. The conditions about the pubiotomy wound have markedly changed. On the anterior surface of the pubic bone there is a slight depression at the site of incision, while posteriorly a rounded ridge 1 cm. wide and 0.5 cm. high extends vertically over it. There is no motility on passive movement of thigh, but slight movement is detected in walking. Genitalia negative. The baby did well after leaving the hospital, but died from typhoid fever when ten months old.

CASE XVII.—No. 3797. Adler. A stout, white o-para, aged thirty-two. Funnel pelvis, 23.75, 28, 32.5, and 20 cm. Diagonal conjugate could not be measured; pubic arch narrow; distance between tubera ischii 7 cm. Posterior sagittal 8 cm.; antero-posterior diameter of outlet 11.5 cm. Child in R. O. T. Patient was seen by Dr. Bergland in consultation after she had been twenty-eight hours in labor. Examination under chloroform showed head below ischial spines; cervix not completely dilated; membranes ruptured.

Admitted to the hospital with a pulse of 120; after having been for thirty-six hours in the first stage of labor. On this account it was determined to complete the dilatation of the cervix by Harris' method and attempt delivery by forceps. During the dilatation of the outlet a slight tear occurred in the left vaginal sulcus, after which the cervix was dilated and the head rotated manually to R. O. A. without difficulty. Forceps were applied, but, as there was no advance in spite of strong traction, Dr. Storrs did a left-sided pubiotomy on January 22, 1909.

There was very little bleeding and delivery was readily effected during which the ends of the bone gaped 4 cm. Immediate expression of placenta, and, as the uterus did not react promptly to a hypodermic injection of ergotol, an intrauterine pack was placed. There was a first degree vaginal tear, as well as one in the left vaginal sulcus extending 4 cm. above the hymen and communicating with the pubiotomy wound. This was packed but not sutured, and the patient put back to bed considerably shocked.

She made a satisfactory recovery, the highest temperature reaching 102 on the eighth day, due to a slight phlebitis in the left groin, which, however, did not give rise to edema. The upper pubiotomy incision broke down on the sixteenth day forming a sinus which closed in some days. The general recovery was good, and the patient conplained of but little discomfort.

On discharge locomotion has excellent, and the pubiotomy wounds were in excellent condition; posterior surface of pubic bone smooth, a slight ridge on anterior surface; slight motility; sacro-iliac joints normal. It was also found that the distance between the tubera ischii had increased 1.25 cm., measuring 8.25 instead of 7 cm., while the antero-posterior of outlet and the diagonal conjugate were unchanged. The child was born in good condition, but presented a deep depression over its forehead, where it had been dragged past the tip of the sacrum. It presented the following head measurements: 13.75, 11.75, 9.25, 8.50, and 8 cm., and weighed 3,430 at birth and 3,940 on discharge.

Subsequent note, February 1, 1910.—Patient is delighted with the result of the operation, and says she can do whatever she did before. Weighs 168 pounds and has suckled baby for one year. Definite shallow depression 1 cm. in width on anterior, but

no trace of section on posterior surface of bone. Definite motility on passive movements. Genitalia normal.

CASE XVIII.—No. 3844. Fingold, white, III-para, aged twenty-five. Two children born dead at term after operative delivery, one being followed by a complete perineal tear; one spontaneous premature labor at seven and one-half months. Generally contracted rhachitic pelvis, 23.75, 25, 28.75, 17, and 9.75 cm. Pubic arch narrow, distance between tubera ischii 8 cm. Anterior and posterior sagittal diameters 5 and 7.75 cm. and antero-posterior of outlet 12 cm. Membranes ruptured spontaneously three days before the onset of labor. After ten and one-half hours of pain the child was found in L. O. T., head not engaged but bulging markedly over the symphysis pubis. External os 5 cm. in diameter with soft margins. On account of the past history and the unfavorable position of the child it was thought best to interfere, although no radical indications were present.

February 24, 1909.—Easy manual dilatation of cervix; typical left-sided pubiotomy. Very slight bleeding; delivered by forceps without difficulty, the bone wound separating 3 cm. The vagina was not torn, but there was a slight nick in the scar of the previous perineal operation.

The puerperium was most satisfactory. The highest temperature was 100.5 except for a rise to 101 on the day of delivery. There was slight edema of the left labium majus and the catheter was employed once. The upper pubiotomy incision broke down to some extent, but the patient was out of bed on the sixteenth day and discharged on the thirty-second day. At that time she walked well and without pain. There was no callus on either surface of the pubic bone, although a slight depression on the anterior surface indicated the site of section, at either end of which there was a definite notch. Definite motility on passive movement of thigh.

The child was born asphyxiated and was resuscitated with difficulty. It weighed 2,080 grams and presented the following head measurements: 12.25, 10.25, 8.25, 7.25, and 6.25 cm. It died on the twenty-seventh day from a streptococcus infection.

This operation was probably unnecessary, as the size of the child had been miscalculated; it being probable that spontaneous labor would have occurred had nothing been done. We were led to interfere more particularly by the fact that the woman was intensely desirous of having a living child. When reexamined eight months later she was in excellent condition.

CASE XIX.—No. 3897. Flynn. White, aged thirty-two years, III-para. One craniotomy and two operative labors with dead children. Flat pelvis, 26, 29, 34, 18, and 10.75 cm. Tubers 9 cm. Child in R. O. T. At the end of three hours of strong second-stage pains the head was still movable at the superior strait, bulging over the symphysis pubis, and showed no tendency to enter the pelvis.

April 18, 1909.—Left-sided pubiotomy by Dr. Storrs. The operation was typical and easy; very slight hemorrhage. Child readily delivered by high forceps, during which the bone wound gaped 4 cm. No vaginal or perineal tear. Convalescence most satisfactory, highest temperature 100 on the fifth day. Practically no pain. Catheterization not necessary. Out of bed on the twentieth and discharged on the thirty-fourth day. At that time the pubiotomy wounds were well healed; no callus on either surface; marked motility on passive movement; sacro-iliac joints normal. Patient walks with some difficulty, but locomotion is far better than before labor when there was marked relaxation of the left sacro-iliac joint, which was only relieved by strapping the pelvis.

The child was born in excellent condition; head measurements, 13, 11.75, 9.5, 9.5, and 8 cm. It weighed 4,870 grams at birth and 5,350 on discharge, and was suckled by its mother.

Patient returned for examination, January 27, 1910, weighing 168 pounds. She complained of some pain and discomfort in the left hip on exertion, but stated that she can do ordinary housework without difficulty; can walk about a half a mile with ease, but begins to limp when she goes further. She does not complain of this as she states that it is far less troublesome than before delivery. On the anterior surface of the pubic bone there is a slight depression corresponding to the incision and a still shallower one on the posterior surface. Median to the latter is a vertical ridge which apparently corresponds to the symphyseal cartilage; sacro-iliac joints normal; marked motility on passive movements of thigh; genitalia normal, except for moderate relaxation of outlet and a bilateral cervical tear. Pelvic mensuration shows that the Baudelocque has increased 2 cm. and the diagonal conjugate 1 1/4 cm., while the outlet measurements are unchanged.

Case XX.—No. 3905. Glascoe. Black, aged twenty-five years, one previous spontaneous labor. Pelvis generally contracted, rhachitic. Measurements, 21.75, 22.5, 28, 17, and 10 cm. Pubic arch normal. Child in R. O. T. Membranes ruptured spontaneously eight hours after onset of labor, when the cervix was 3 cm. in diameter and the head movable above the pelvic brim, overlapping the pubis. Following this a caput developed, and six and one-half hours after the rupture of the membranes the cervix was almost completely dilated; the head still floating, and as the fetal heart sounds had become irregular, pubiotomy was decided upon.

June 18, 1909.—Left-sided operation, Dr. Storrs, preceded by preliminary stretching of the outlet and completion of the cervical dilatation. After severing the bone, which separated 4 cm., the head could be forced into the pelvis, whence it was extracted by forceps in good condition. No perineal or vaginal tear.

The convalescence was quite satisfactory, although there was

considerable abdominal distention for the first few days. The temperature reached 102.2 on the second day, but at no time was the patient seriously sick, nor did she suffer materially. Some slight swelling of the labium majus. Not catheterized. Out of bed on the twentieth and discharged on the thirty-first day in good condition. Locomotion good, no complaint, no note as to motility; genitalia normal.

The female child was born in good condition and weighed 3,750 grams at birth and 4,550 at discharge. Head measurements, 14, 12, 9.25, 9.50, and 7.75 cm. Suckled by mother.

Patient wrote from Philadelphia, January 2, 1910, that she walks as well as before the operation and could make no complaint of any kind.

CASE XXI.—No. 4092. Solen. White, II-para. Both children born dead after operative delivery elsewhere. Pelvis generally contracted, rhachitic. Measurements, 24, 25.25, 28.75, 17, and 10.5 cm. Patient admitted at 8 P. M., after having been in labor three hours. Child in L. Ac. dorso-posterior position, attempts at external version unavailing. Vaginal examination one hour later showed the cervix fully dilated and the membranes unruptured. In view of the history of two dead-born children and the pelvic measurements, it was decided to place a Gigli saw prophylactically, rupture the membranes and turn and extract the child, and to resort to pubiotomy in case of difficulty.

At 10.15 P. M., September 7, 1909, Dr. Slemons placed the saw in position as for a left-sided pubiotomy, and after rupturing the membranes, readily performed version and extracted the child up to the head without difficulty. As that did not follow after one minute's vigorous traction, aided by pressure from above, the pubis was sawed through. The ends of the bone gaped 3 to 4 cm. and readily permitted the extraction of a live child. A slight tear extended up the left anterior vaginal sulcus and communicated with the bone wound. Repaired with catgut. Perineum not torn.

Puerperium satisfactory. Very slight edema of left labium. Very little complaint; highest temperature 100.4 on the fifth day. Not catheterized. Up on the nineteenth day and discharged on the twenty-fifth day, feeling perfectly well, walking without difficulty and complaining of no pain. Wounds well healed; some callous tissue on anterior surface of pubic bone. Moderate motility.

The male child was slightly asphyxiated, but readily resuscitated and weighed 4,000 grams at birth and 4,240 on discharge. Head measurements, 12.5, 11.5, 9.5, 9.5, and 7.5 cm. Suckled by mother.

Subsequent note, February 5, 1910.—Patient states that she has done very satisfactorily since the operation, walks as well as ever, and can attend to her ordinary household duties without difficulty. When, however, she seriously overexerts herself she suffers some pain in the left hip, which is gradually growing

less. Has suckled her child which has done excellently. Examination shows normal genitalia, except for a movable retroflexed uterus. The pubic bone is not thickened and shows no trace of section on either its anterior or posterior surface. Definite motility on passive movement of thigh. Mensuration shows no appreciable change.

CASE XXII.—No. 4107. Wescott. Black, aged sixteen years, 0-para. Pelvis, generally contracted funnel; measurements, 24.5, 26.5, 31, 19, 10.75, and 9 cm. Pubic arch narrow, tubers 7 1/2 cm. Child in R. O. P.

Patient had slight pains three days. On admission the membranes were bulging; cervix completely dilated, head freely movable at superior strait. On account of the history of prolonged labor and the fact that the child seems to be large, pubiotomy was decided upon.

September 16, 1909.—Typical left-sided pubiotomy, Dr. Ainley. Very little hemorrhage. Scanzoni application of forceps; easy extraction; bones separated about 5 cm. Communicating vaginal tear in left sulcus 6 to 7 cm. long closed with catgut. Slight perineal laceration, two sutures.

Puerperium febrile, but otherwise satisfactory; temperature 103.2 on the tenth day. Gonococci in uterine lochia. Not catheterized. Patient out of bed on twentieth day; left hospital on twenty-ninth day. On discharge the pubiotomy wound was excellent; on anterior surface of pubic bone a slight furrow, with a notch at its lower end; posterior surface smooth; marked motility on passive movement; locomotion excellent and without pain. Uterus retroflexed, movable, well involuted; perineum well healed.

The male child was born somewhat asphyxiated, but was readily resuscitated. Weighed 3,700 grams at birth and 3,630 on discharge. Mixed feeding. Head measurements, 13.5, 12, 9.75, 9.25, and 8 cm.

CASE XXIII.—No. 4111. Jackson, black, aged twenty-five years. One difficult but spontaneous labor March, 1904. Pelvis generally contracted, rhachitic; measurements, 23.5, 24, 28, 17, and 10 cm. Pubic arch normal; tubers 13 cm.

The patient was seen by the out-patient department twenty hours after the onset of labor. The membranes ruptured spontaneously an hour or so later, and as the head did not engage she was sent to the hospital. On admission the head was in R. O. P. above the superior strait; severe and frequent pains.

September 18, 1909.—Pubiotomy by Dr. Ainley on the left side five hours after rupture of the membranes. Operation easy. Head rotated manually to R. O. T., easy forceps delivery during which the ends of the bone gaped for 3 cm. Perineum or vagina not torn.

Convalescence most saitsfactory, no discomfort; highest temperature 100. Patient turned spontaneously on her side the night of the operation, and in the absence of the nurse on the

fifth day got out of bed and took a few steps, but suffered no ill effects from it. Catheterization not necessary. Walked without difficulty at the end of the second week and was discharged on the twenty-sixth day. At that time there was no trace of the bone wound on either surface of the pubis, but shallow notches were felt on its upper and lower margins. Slight motility on passive movement. Genitalia in excellent condition. The child weighed 2,860 grams at birth and 3,350 on discharge. Suckle by mother. Head measurements, 13.25, 11.25, 9.75, 9.5, and 8 cm.

Subsequent note, February 3, 1910.—Patient reports that she walks as well and works as hard as at any time in her life, and suffers no pain or discomfort. On examination the genitalia are normal; no thickening at site of section, but a shallow depression marks its situation on the anterior surface, while nothing can be felt posteriorly. Distinct motility on passive movements. Pelvic measurements indicate that the diagonal conjugate had become 0.75 cm. longer.

CASE XXIV.—No. 4185. Thanner. White, aged twenty-two years, 0-para. Simple flat pelvis, 25.75, 27, 31.5, 18, and 9.75 cm. Pubic arch fair, tubera ischii 9 cm. Patient fell into labor at 8 A. M., November 14, 1909, and entered the hospital that evening with the cervical canal obliterated and the external os admitting one finger. Child in L. O. T. overlapping the symphysis. The cervix became fully dilated after thirty-four hours of labor when the membranes were ruptured artificially. No advance after three hours of strong second-stage pains. Marked posterior parietal presentation with the sagittal suture 2 cm. behind the symphysis.

November 15, 1909.—Typical left-sided pubiotomy by Dr. Ainley. Forceps extraction without difficulty, the bone wound gaping 4 cm. Moderate amount of bleeding; slight nick in fourchette and a tear 4 cm. long extending up the left anterior vaginal sulcus and communicating with pubiotomy wound. Repaired with catgut.

Puerperium was satisfactory, highest temperature 101.5 on the third day. Slight edema of the labium majus. Imperfect healing of vaginal wound. Patient walked in the third week and was discharged in good condition on the thirtieth day, when she walked without difficulty, There was a distinct separation between the cut ends of the pubic bone of at least 1 cm. and definite motility on passive movement. Genitalia in excellent conditon.

The male child weighed 2,830 grams as birth and 3,530 on discharge. Head measurements, 13, 11, 8.5, 8.25, and 7 cm.

Patient returned for inspection January 24, 1910. States that she has done very well. For sometime after returning home she suffered considerable pain in the pubiotomy wound, which has gradually disappeared so that she can walk miles without difficulty. Pelvic examination negative, except for small

retroverted uterus (lactation atrophy). Mensuration shows definite enlargement of pelvis. Conjugata diagonalis 10.75 instead of 9.75 cm., and transverse of outlet 10.5 instead of 9 cm.; an increase of 1 and 1.5 cm., respectively.

CASE XXV.—No. 4253. Wilson. Black, aged twenty-two years, I-para. Operative labor, the child dying the day afterward. Generally contracted rhachitic pelvis, 25, 24.5, 29.5, 16, and 10.25 cm. Pubic arch fair; tubers 8.5 cm. The pelvis is also somewhat oblique owing to a rachitic kyphoscoliosis with a hump in the dorsal region and the convexity of the scoliosis to the right side.

Child in L. O. A., not engaged. The membranes ruptured after fifteen hours of first-stage pains when the cervix was 5 cm. in diameter; seven hours later it was fully dilated. No engagement after two hours of strong second-stage pains with marked overlapping of the bones and a large caput. At the same time the temperature rose to 100.2 and the fetal pulse to nearly 160 per minute. In view of these conditions pubiotomy was decided upon.

January 12, 1910.—Left-sided pubiotomy by Dr. Ainley. Easy, high forceps, during which the cut ends of the bone separated 3 cm.; vagina not torn, and only a slight nick in the perineal mucosa. Convalescence most satisfactory, and the patient scarcely complained of pain at any time. Highest temperature 101.4 on the fifth day. Turned spontaneously on the third, sat up on the eleventh and was out of bed on the twenty-first day. Slight edema of the left labium majus which did not cause discomfort. Catheterization not necessary.

The child was somewhat asphyxiated, but was readily resuscitated. It weighed 3,025 grams at birth, and its head measured 12.5, 10.5, 9, 8.25, and 7 cm. Was suckled by mother.

On discharge on the twenty-seventh day, patient walked perfectly and suffered absolutely no discomfort of any kind. The genitalia were normal; no callus on either surface of the bone section, but slight motility on passive movement of the thigh. Mensuration of the pelvis indicated that permanent enlargement had not resulted.

CASE XXVI.—*Prophylactic Placing of Gigli Saw.*—No. 4125. Miller. White, 0-para, aged twenty-three years. Pelvis generally contracted, 23, 27, 35, 19, and 11 cm.; tubera ischii 9 cm.

The patient was admitted to the hospital after having been in labor nearly sixty hours, with the cervix fully dilated and a frank breech at the spines in L. S. P. Accurate palpation was impossible owing to the tense abdomen, though its large size suggested an unusually large child. The pains were poor for the next few hours and no advance occurred.

Thinking that the dystocia was probably due to the size of the child, Dr. Ainley upon my advice placed a Gigli saw in position on the left side before attempting extraction, so that pubiotomy could be promptly performed if difficulty were experienced.

The child, however, was readily extracted and was found to be small and slightly asphyxiated. Following its delivery an unruptured amniotic sac protruded from the cervix, and on rupturing it a second child was found lying in R. S. A., which was readily extracted by Mauriceau's method. A second degree perineal tear resulted, which was repaired as well as the provisional pubiotomy wound. The children were females and weighed 2,790 and 2,980 grams, respectively.

During the course of the night the patient complained of poor vision and five hours after delivery had a typical convulsion, which was followed by sixteen others. She recovered under the usual treatment, although for the first few days there was marked mental disturbance. The temperature rose to 103.4 on the fifth and fell to normal on the tenth day. The patient and her children were discharged on the nineteenth day in good condition.

CASE XXVII.—Subsequent note to case VI (previous article). *Autopsy findings showing effect of pregnancy upon a pelvis previously subjected to pubiotomy.* No. 4116. Black, I-para. Generally contracted rhachitic pelvis, 21, 23, 29, 16.5, and 9.5 cm. Pubic arch wide, tubers 21.5 cm. Marked motility at site of old pubiotomy wound.

Entered the hospital September 22, 1909, threatened with premature labor. Under rest in bed and medicinal treatment the symptoms passed off and she went uninterruptedly to term. Examination on October 23 showed a moderately large child in L. O. T. with the head projecting markedly over the pubis, which could not be impressed into the pelvis by Müller's method. In view of the fact that the last labor had been ended by pubiotomy, with a child weighing 3,220 grams whose head presented a deep promontory depression, it was thought that radical interference would be required at the approaching labor, and that a primary Cesarean section at its onset would be more conservative than a second pubiotomy. Accordingly, directions were given that the patient should not be examined vaginally and preparations be made for Cesarean section at the beginning of labor.

November 10, 1909.—Typical conservative Cesarean section three hours after the first pains. The child was delivered in good condition, weighed 3,430 grams and presented the following head measurements: 13.5, 11.5, 9.5, 9.75, and 8.5 cm. It was fed artificially and weighed 3,645 grams when it left the hospital. Owing to an unfortunate break in technique, the patient became infected and died from general peritonitis the sixth day after operation.

The anatomical diagnosis at autopsy was: Subinvolution of uterus and retention of placental tissue and fetal membranes; streptococcus endometritis; acute fibrino-purulent peritonitis; acute sero-sanguineous pleurisy (bilateral), with compression of left lung; bronchopneumonia; acute splenic tumor; cloudy swelling of viscera, fatty degeneration of liver, generally contracted rhachitic pelvis.

On completing the autopsy, the entire pelvis was excised together with the lumbar vertebra and the upper ends of the femora, and its study showed most interesting conditions. Unusual motility existed at the old pubiotomy wound which, after removing the muscles as well as possible, was found to be filled by a thick mass of soft connective tissue. This buckled markedly when the two sides of the pelvis were pushed together, and permitted a lateral excursion of 1 1/2 cm., and a vertical one of 2 1/2 cm.

The true conjugate measured 9 cm. instead of 7.5 or 8 cm. as calculated, although it is possible that the increase may have been due to the relaxation incident to the removal of the pelvis from the body. The transverse diameter of the superior strait could be increased from 12 to 13 cm., the distance between the anterior and superior spines from 20 to 21 cm., and that between the tubera ischii from 11 to 13 cm. as the cut ends of the bone were in contact or drawn apart. The antero-posterior diameter of the outlet measured 11 cm. and was not affected by lateral movements of the pelvis.

An *x*-ray picture showed that the pelvis had become so rotated on the sacrum that the median fragment of the left pubic bone, instead of the symphysis pubis, lay in the midline opposite the center of the sacral promontory, and that the anterior margin of the right sacro-iliac joint had been somewhat spread apart in consequence.

The entire pelvis was then hardened in formalin, and later, in order to study the conditions at the pubiotomy wound, a block measuring 6.75 cm. in length and 1.75 in height was sawed out from the central portion of the anterior pelvic wall, approximately equidistant from its upper and lower margins. On its upper surface no trace of the median fragment of the left pubic bone was visible, while the distal end of the latter was separated from the symphyseal end of the right pubic bone by a mass of fibrous tissue 3.5 cm. broad on its anterior and 2.5 cm. on its posterior aspect. The portion of this tissue adjoining the right pubic bone was composed of cartilage, while its left half presented a different appearance, being made up partly of cartilage and partly of fibrous and muscular tissue interpolated between the former and the distal end of the left pubic bone. The free surface of the latter was covered by a layer of cartilage 1 to 1.5 mm. thick under which there was a compact layer of bone apparently continuous with that on its anterior and posterior surfaces.

On the lower surface of the block a totally different condition prevailed. The anterior ends of the bones being 3 and the posterior ends 2 1/2 cm. apart, while the space between them was filled out in great part by cartilage, in the center of which was an oblong piece of bone 8 x 4 mm., corresponding to the median fragment of the left pubic bone. This lay nearly 1 cm. below the level of the superior margin of the horizontal ramus.

The space between it and the distal end of the left pubic bone was in great part filled out by what appeared to be infolded muscular tissue while the free end of the median fragment was covered by cartilage.

On sawing the block longitudinally, it was found that the median fragment of bone occupied only its lower portion, so that its height was considerably less than one-half that of the pubis. Whether this was due to its having sunk down or to the elevation of the distal end of the severed bone cannot be ascertained, but in any event it is apparent that the median fragment had undergone marked atrophy; as originally it must have been of the same height as the rest of the pubic bone, and extended from the median side of the pubic spine to the symphysis pubis.

The following note was also made: "The extent of motility was a great surprise to us, and was so pronounced that it seems that spontaneous labor might have occurred had the patient been left alone, provided of course that the same degree of motility was present during life, as was noted in the excised pelvis."

## CONCLUSIONS.

1. In twenty-five pubiotomies performed at the Johns Hopkins Hospital there were no maternal and three fetal deaths, only one of which was attributable to the operation.

2. All patients were delivered by forceps or version immediately after the pubiotomy. There were no injuries to the bladder, six perineal and five deep communicating vaginal tears, notwithstanding the fact that twelve of the patients were primiparæ.

3. The relative infrequency of injury to the soft parts is attributed to restricting the operation to suitable grades of pelvic contraction and to the employment of Doederlein's technique, but particularly to extensive manual dilatation of the vagina and perineum prior to operating. The occurrence of such injuries may be still further decreased by making horizontal instead of upward traction when delivering the head through the vulva.

4. The after-treatment is not so onerous as is generally stated, and most of the patients suffer but little. Immobilization of the pelvis is not necessary, a 4-inch adhesive strip around the trochanters being sufficient. The patients usually move spontaneously in bed between the second and fourth days, get up between the fifteenth and twentieth, and are discharged on the thirtieth day with satisfactory locomotion. Healing generally occurs by fibrous union, so that there is definite motility between the ends of the bone in at least two-thirds of the cases.

5. The maternal mortality should not exceed 2 per cent.

provided the operation is performed by competent operators upon uninfected women who have not been exhausted by previous attempts at delivery.

6. It is indicated in contracted pelves when the conjugata vera exceeds 7 cm., and after a test of several hours in the second stage of labor has shown that the disproportion cannot be overcome, as well as in certain funnel-shaped pelves.

7. Prophylactic placing of the saw is indicated prior to breech extractions or versions from transverse presentations when it appears problematical whether the head can pass through the pelvis, and the bone sawed through immediately after discovering that the disproportion cannot be overcome.

8. In multiparæ with a history of repeated difficult labors, or in primiparæ presenting excessive disproportion, pubiotomy is inferior to Cesarean section performed at the end of pregnancy or at the onset of labor; otherwise it does not enter into competition with it, as the former is the operation of choice in borderline pelves after the patient has been subjected to the test of labor, and at that time it is many times less dangerous than the classical Cesarean section.

9. In uninfected women it should replace high forceps, prophylactic version, induction of premature labor and craniotomy upon the living child. In how far it may compete with supra-symphyseal Cesarean section must be shown by future observation.

10. It should not be employed in infected patients or after failure to deliver by other means. It should be regarded as a primary operation whose dangers are infection, deep tears, and hemorrhage.

11. Where the separation between the cut ends of the bone does not exceed 4 or 5 cm., the patients recover perfectly and are able to walk and work as well as ever.

12. In view of the fact that the bone section usually heals by fibrous union, a certain degree of permanent enlargement of the pelvis may follow, particularly in the transverse diameter of the outlet and less so in the conjugate vera. Under the influence of the hyperemia incident to a subsequent pregnancy, this may occasionally become markedly exaggerated and be sufficient to permit spontaneous labor. Should this not occur, a second pubiotomy may be performed, while Cesarean section should be limited to those cases in which the pelvic contraction is marked and the child large.

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