

THE TECHNIQUE OF FORCEPS

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Since a recognition of the possible dangers has become more general, the use of the forceps has been established as an operation of great dignity in modern obstetrics, and the principles that should govern the employment of the instrument have been exhaustively studied.

In spite of a sporadic tendency toward the use of the axis-traction instrument for all cases in which forceps are indicated, it is a fact that some form of the shorter instrument is most commonly used throughout America and Europe. There have been almost innumerable modifications of the forceps, but the most popular, and the one most in accord with the scientific principles which should govern its employment, is the so-called Simpson forceps, which was termed by Jaggard "the most perfect surgical instrument ever devised."

Whatever the indication may be which impels the obstetrician to apply forceps, there are certain conditions which *must* be fulfilled and certain preparations which should be carefully made, in justice to the patient and the operator, before the operation is attempted.

The conditions of most importance may be briefly referred to.

1. *The head must be engaged* (i. e., the largest diameter of the head has passed the bony inlet). If this condition is not fulfilled, *version*, and not forceps, should be the operation of election.

2. *No serious disproportion should exist between the head and the pelvis.*

It is difficult to fix the boundaries for this condition, but, in general, it may be stated that a pelvis with a conjugate vera of less than 8.5 cm. will not permit the unutilated head of an average mature child to pass.

If forceps are applied in such cases, the result may be similar to cranioclasia in many instances.

In the case of hydrocephalus, the forceps slip and are ineffective, while the instrument is contra-

indicated in premature and microcephalic cases, unless an especially small pair is at hand.

3. *The cervix should be effaced and the os dilated (or easily dilatable).*

Otherwise lacerations of a deep and dangerous character may occur, extending into the vaginal vault, or even into the peritoneal cavity, with sequential serious hemorrhage at the time, or a subsequent severe infection, or both.

Furthermore, the cervix may be grasped and crushed (or torn) by the blades of the instrument, or such a degree of traction may be exercised upon the bladder that dysuria or incontinence results.

4. *The bag of waters must be ruptured and the membranes retracted.*

The violation of this condition may result in a dislocation of the placenta, and produce a severe hemorrhage, or asphyxiation of the child.

5. *The child should be living*, otherwise perforation and cranioclasia becomes the operation of election.

The forcible delivery of a mature child by means of forceps is so serious an operation that it should not be attempted, out of regard for the maternal tissues in the case of a dead child, but, naturally, this condition is only relative, and the sentiment or the religion of the parents often demands the operation, but the risks and the dangers should be carefully explained. In any case where doubt exists as to the viability of the child, *of course* use forceps.

6. *The forceps should not be applied to the breech of the living child*, on account of the danger to the tissues of both child and mother.

Serious lacerations over the sacral bones of the child and fatal compression of the blood-vessels have resulted from such an unwarranted application to the breech. For this purpose the blades are poorly adapted, and they readily slip and cause serious injury to the maternal soft parts. An expert operator *may* possibly use forceps in

this manner without injury, but he rarely does so, because he has learned what a greatly superior instrument for this purpose he possesses in his fingers.

It is essential, also, to note the size of the caput succedaneum, the condition of the mother, and the foetal heart tones.

An operation undertaken in behalf of mother and child should not be delayed until either is unable to benefit by it.

A large caput means that the child has been fixed for a long time, and that the natural powers are unable to effect the delivery.

Some of the above conditions are frequently and grossly violated, as, for instance, the application of the forceps while the effacement of cervix and the dilatation of the os are incomplete, or before engagement has taken place, or without an accurate knowledge of the presentation and position.

The necessary preparations involve the patient, the operator, and the environment.

The Patient. The bladder and rectum must be emptied. The pubic hair should be shaved, if possible — clipped close, at any rate.

The abdomen, which has been radically cleansed in preparation for the labor, is again scrubbed with a nail-brush, green soap, and hot water, from breasts to pubis, as well as vulva, perineum, and thighs. The excess of soap is washed off and the parts scrubbed again with one-per-cent lysol solution, followed by 1-4000 bichloride solution and with sterile water, followed by lysol solution. A gauze pad wet in the latter is then placed over the vulva. Disinfection of vagina is required only where venereal infection is suspected.

The thighs are covered with sterile sheets or footed drawers, the abdomen with a sterile sheet, and the patient is placed in dorsal position on the kitchen-table, which has been covered with a blanket or comfortable, a rubber sheet, and a sterile linen sheet. The thighs are flexed in exaggerated lithotomy position, and retained by a leg-support (Robb), an improvised sheet-sling, or upheld by an assistant; another assistant gives the anæsthetic, chloroform being preferred. The field of operation should be well illuminated, either by natural or artificial light.

The operator carefully prepares his hands, nails, and arms with soap, hot water, and nail-brush, followed by lysol and bichloride solution, just as he would for a major surgical operation, and draws on his rubber gloves, which have been well boiled (15 to 20 minutes).

He now makes an examination and determines accurately the presentation and position.

To the right of the operator should be a table, upon which is placed his pan of instruments (boiled 20 minutes), which contains, in addition to the forceps, tape for the cord, instruments for perineorrhophy and for packing the uterus in case of hemorrhage. Aseptic ergot, boric-acid solution for infant's eyes, sterile gauze in rolls and pledgets, vulvar pads, cotton and gauze sponges. Urethral and tracheal catheters should set within easy reach.

On the left hand should be a bench or table, holding basins of hot sterile water and hot one-per-cent lysol solution, with plenty of sponges. Experience in Chicago Lying-in Hospital service has convinced the writer that unsanitary and filthy conditions of the room where the operation is done, do not affect the result if the operator, and field of operation be properly prepared and aseptic sponges, pads, sutures, etc., be employed.

Let us assume that the operator has diagnosed the most common of the conditions which require instrumental help, namely, the head at the pelvic outlet, and rotation complete, or nearly so. He first passes the catheter as a routine measure, and then proceeds with the operation.

There are four steps or stages to the operation: 1. The application; 2. The adjustment; 3. The extraction; and 4. The removal.

Two principles control.

1. *Law of the Forceps.* The front of the forceps must look towards the point of direction (i. e., in

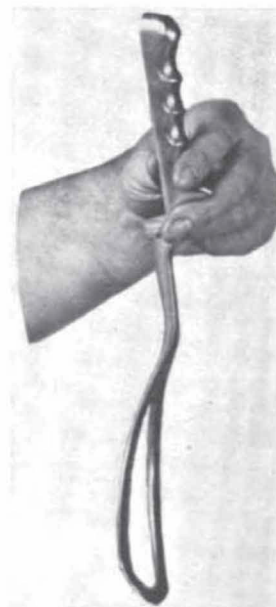


Plate I. Method of holding blade prior to introduction.

occipito-anterior cases the front of the forceps looks toward the occiput; in face cases, the chin, etc.).

2. *Rule of the Forceps.* Left blade first. Left blade in left hand, to left side of mother. Right blade in right hand, to right side of mother, last.

Two fingers of the right hand are passed through the vulva and into the vagina, on the left side of the foetal head (also mother's left side); upon reaching the cervix the fingers pass inside again and inside the membranes. The flexor surfaces of the fingers should now rest against the left side of the foetal head, *without any intervening tissue.*

The left hand now grasps the handle of the left blade in such a way that the first finger is above the hook and at right angles to it, the second finger below the hook, and the thumb on the opposite side. (Plate I.) The blade now swings easily in this grasp, and with no more force than that used in passing a male sound the tip of the blade is guided along the palmar surface of the two fingers of the right hand into the vagina and alongside the head. (Plate II.) As the blade enters, the cephalic curve adjusts itself to the head; the handle, which at first was almost vertical above the vulva (a little to operator's left), is now gradually depressed. (Plate III.) The grasp of the hand changes with the new position, until the full hand grasps the handle about the time the blade reaches a horizontal position, and the cephalic curve of the blade comes into its proper relation to the foetal head. As the blade passes into the vagina, the thumb of the right hand instinctively guides and supports the lower edge of the blade. If the directions are carefully followed, the blade falls almost of its own weight into the proper relation, and the handle rests on the perineum. Two fingers of the left hand are now introduced in the same way into the vagina, on the right side of the mother and the right side of the foetal head, and all maternal tissues and membranes are segregated on the extensor surface of fingers, while the palmar surface acts as a guide for the right blade, which, in the grasp of the right hand, is passed in a similar manner as above to the right side of the mother. (Plate IV.)

Second step. *Adjustment.* Operator now *sits down* in front of patient. The blades of the forceps now grasp the head with the cephalic curve, the front of the forceps looks toward the small fontanelle, and the pelvic curve is adjusted to the pelvis. The handles must now be *locked*, or adjusted, but before doing this, be sure that the blades grasp *only* the foetal head, and no part of the mother or membranes; also, compress the handles, and at same time listen to the foetal heart

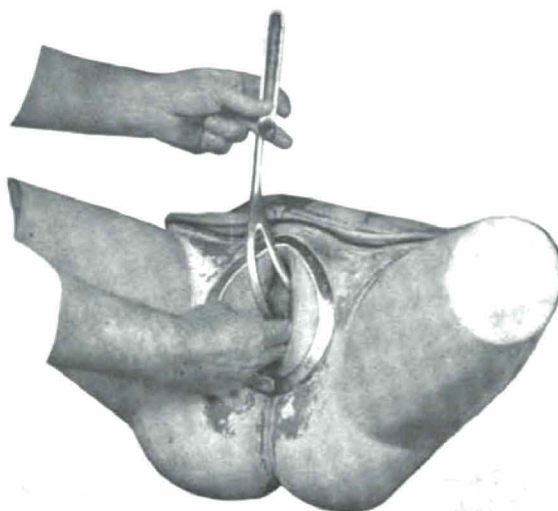


Plate II. Introduction of first (left) blade.

tones to be certain that the tips of the blades do not compress the cord and shut off the circulation. Now grasp each handle in right and left hands, respectively, and gently depress them to the perineum; if the right and left portions of the lock do not come into apposition, press down again and twist the blades slightly by pressure of the thumbs on the hook, and if this fails, press down, twist as before, and, in addition, pushes lightly into the pelvis. (Plate V.) If this does not succeed, remove the blades and reapply, as there is some obstacle preventing the proper adaptation. After locking, listen to the heart tones again.

Third step. *Extraction.* A gentle traction

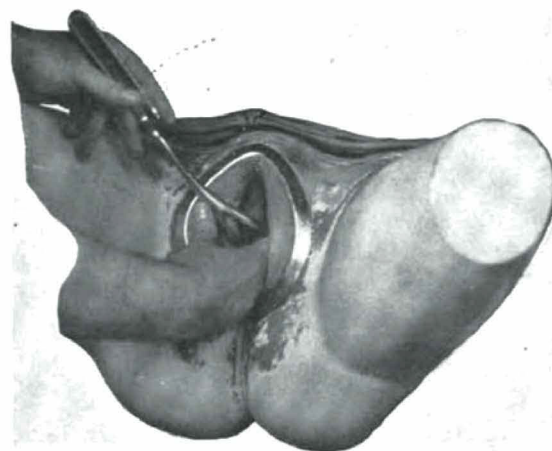


Plate III. Simultaneous progression of blade under control of fingers and thumb and depression of handle

(trial traction) will now determine if the blades lie properly, and the direction of the handles will indicate the direction in which traction should be made. In making traction all the force *may* be employed which can be obtained with the forearm flexed on the arm, and with elbow at the sides of the body, but in no case should we use more power than absolutely necessary. Simulate the gradual increase in power and the slow relaxation of the normal uterine contractions. Pull with the pains if possible, and attempt to produce good contraction, when absent, by massage.

No pendulum or side-to-side movements of the hands can be permitted, as they are unphysiological, and are many times injurious. Traction must be made along the line of the pelvic axis.

When traction is made, the handles should be grasped with both hands (Plate VI), at right angles with the long axis of the instrument, one hand over the lock, the other on the handle proper, the *thumbs underneath*, and with the elbows at the sides of the body. Make slow, even traction, a little downward from the horizontal plane, relax the handles, watch the foetal heart tones, and then repeat. The intent is to produce an intermittent advance and recession of the foetal head in imitation of the natural process.

The head soon begins to bulge the perineum, and the handles point more and more upwards, and indicate thereby the direction in which traction should be made. Sponge between tractions, and watch perineum. The nucha now comes under the pubes, and extension begins. Take

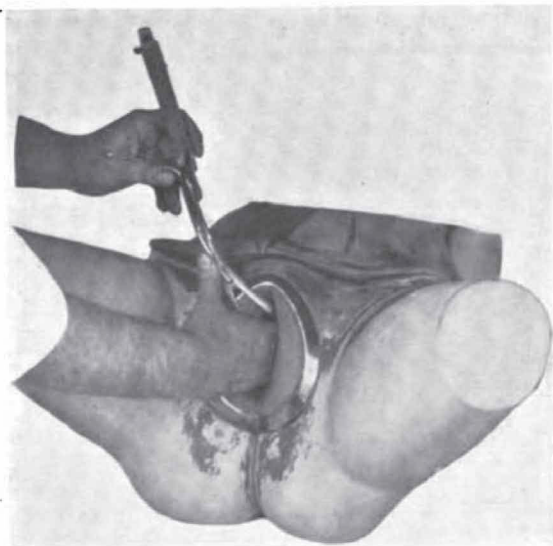


Plate IV. Introduction of right blade. Note the exclusion of the left blade from field of operation.

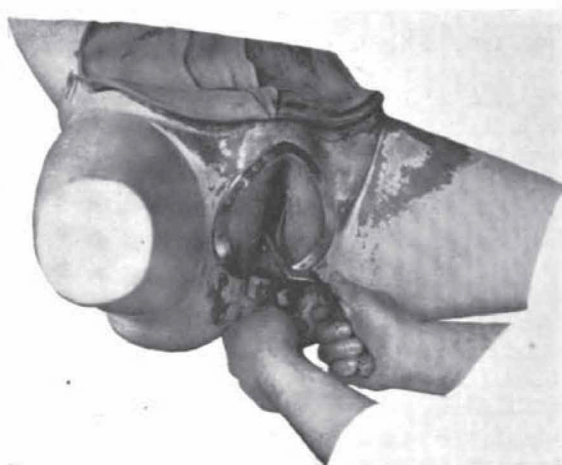


Plate V. Adjustment handles are grasped with thumbs on the hooks and depressed to lock.

plenty of time, guard the perineum, and when the head has passed the pelvic bones and extension is well under way, the blades may be removed and the head expressed by a modified Ritgen's maneuver. Episiotomy may be done if required.

The delivery takes place in obedience to the natural mechanism, and if blades are not removed, the operator stands at one side while the traction and *vis à tergo* bring the handles more and more over the maternal abdomen. (Plate VII.) The nape of the neck is kept close up against the symphysis, and as much as possible, one should allow the natural elasticity of the vulva to draw it back over the advancing part until the delivery of the head is complete.

Fourth step. Removal. Unlock the blades and lay them with one hand back in the pan or on a sterile towel, and let the head fall into the other hand. If the blades are removed while the head is still within the vulva, remove the right blade first, and be careful not to injure the ear of the child.

With the delivery of the head the function of the forceps terminates, and the extraction of the body and the conduct of the third stage follow in accord with their own laws and regulations.

Deep Transverse Arrest of the Head. This is the first deflexion position, and the one in which formerly the vectis was most frequently and successfully employed.

The aetiology and mechanism can be passed over here.

Diagnosis. The fingers enter the vagina and encounter the foetal head in the plane of the pelvic outlet, lying with its long axis parallel with the transverse diameter of the pelvic outlet, the large

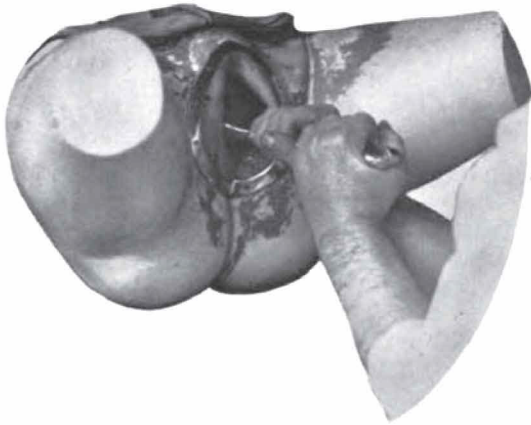


Plate VI. Extraction. Note position of hands and elbows. This position can only be secured by the seating of the operator somewhat below the field of operation.

fontanelle on one side, the small fontanelle on the other, and about the same level (sometimes the small fontanelle is slightly higher), connected by the saggital suture, against which the fingers impinge. The labor is at a stand-still and rotation does not occur. (Plate VIII.)

The arrest of the labor entails great danger for mother and child; for the mother, exhaustion, possibly sepsis or rupture of the uterus, necrosis of maternal tissues, with sequential vesicovaginal or rectovaginal fistulae.

The child may become infected, the scalp or cranium necrosed, or the cord compressed. Death may occur from trauma or from the prolongation of the labor.

If danger for either mother or child is present, or, in the absence of such a menace, after a delay of two and a half to three hours without progress, the indication is definite to deliver with forceps. From a study of the cases it is probable that of all instances where the forceps are applied under strict indications, that deep transverse arrest is present in about thirty-five per cent. One need not be idle, however, during this period of delay.

The woman should be placed upon the side toward which the occiput points, whereby flexion is facilitated and pressure with the ends of the fingers upon the sinciput during a pain may be of great assistance in securing flexion. If this fails after reasonable trial, the half-hand may be carried in behind the posterior parietal bone, and an attempt made to rotate the occiput forward. Failing in this, the forceps may be applied.

The preparations are the same as before described.

In the peculiar application of the forceps lies

the necessity for accurate diagnosis. The forceps blades are constructed for application to the sides of the head, but if so applied in "deep transverse arrest," they will lie in the anteroposterior diameter of the pelvis, which is not a satisfactory position for forceps with such a pronounced pelvic curve as the Simpson instrument has, neither can the blades lie in the sides of the pelvis, because the foetal head would be grasped in its anteroposterior diameter, which is a bad position for the head, and an unfavorable one for the forceps. Hence a compromise is necessary, and the blades must be applied in one of the oblique diameters, with the pelvic curve toward the occiput. If the occiput lies to the woman's left, the forceps should be applied in the left oblique (i. e., a line passing between the blades lies in the left oblique diameter of the pelvis), the right blade resting on the anterior malar bone, and the left on the posterior parietal protuberance. (Plate IX.)

When the occiput points to the right, the forceps lie in the right oblique, etc.

The application presents some difficulties. The patient being in dorsal position on the table, with elevated thighs, the left blade is passed along the palmar surface of the right hand into the hollow of the sacrum behind the head, and *allowed to remain there if occiput points to the left*, while the right blade is introduced into the hollow of the sacrum and carefully rotated under the guidance of the fingers, over the face of the child to the anterior malar bone.

If the occiput lies to the right, the left blade is rotated into position over the anterior malar bone before the right blade is introduced.

Since the head is grasped in a larger diameter, care must be used to avoid too much compression on the head during traction; hence a finger or towel should be placed between the handles.

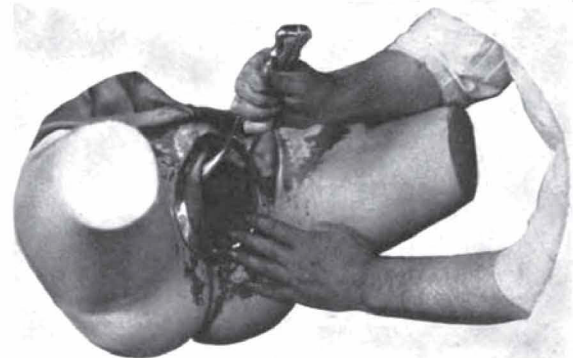


Plate VII. Delivery in extension, the handles pointing more and more upward. Operator stands.

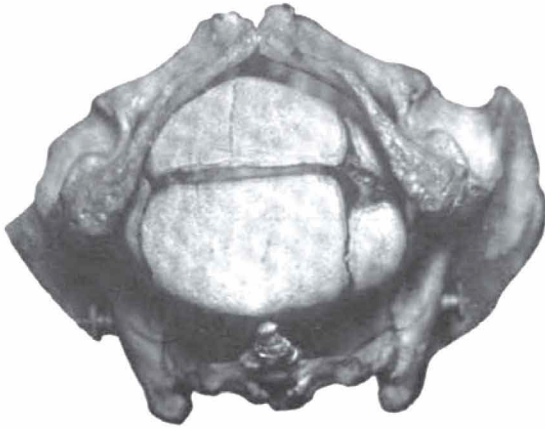


Plate VIII. Deep transverse arrest of head. Note position of fontanelles and sagittal suture.

Two objects must be kept in view — rotation and extraction. The occiput should not be rotated forward directly, as some advise, for fear of lacerating the vaginal walls, but traction and rotation must be simultaneous, and about in the proportion of two traction to one of rotation. Occasionally, however, the vagina will be torn in difficult cases, in spite of every precaution.

After each traction the handles should be relaxed and the sutures and fontanelles examined to note progress. Readjustment of the blades should be made as often as necessary until they lie in the sides of the pelvis and grasp the sides of the foetal head. After rotation occurs, the blades *may* be removed, and if the pains are strong, nature may be allowed to terminate the case, assisted possibly by Ritgen's maneuver (modified).

In most cases, however, the rotation will be

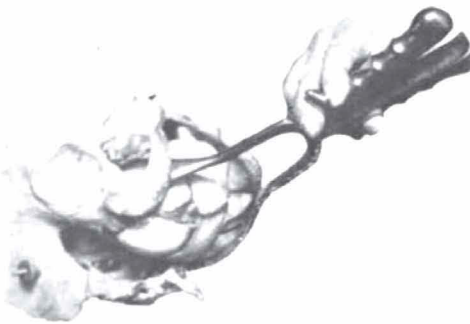


Plate IX. Occiput *læva transversa*. Blades grasp anterior malar bone and posterior parietal bone. Note interval between handles.

followed by immediate extraction, since the necessity which requires interference carries with it the demand for delivery, which is now conducted on the principles described above for "low forceps."

The use of the axis-traction instrument for all cases requiring forceps is the rule in Scotland and Dublin, and the practice is not uncommon in France. In this case the axis traction forceps may be applied directly to the sides of the pelvis, irrespective of the position of the head; rotation occurs without interruption from the blades, and the results are generally satisfactory.

If the child is living and forceps have failed, symphyseotomy may be considered. If the child is dead, no attempt should be made to apply forceps, but, in behalf of the mother, the indication

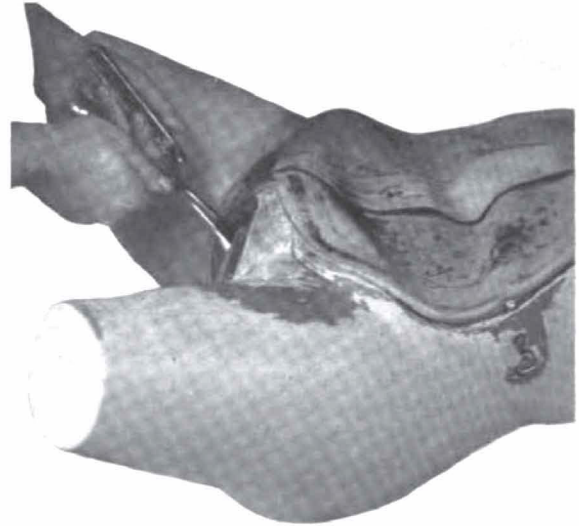


Plate X. Face positions require that the handles be raised to lock.

is absolute to perforate, crush, and finally extract the diminished head.

In Occipito-posterior Positions. When the occiput enters the pelvis in the posterior quadrant, the mechanism of the labor is considerably disturbed, and various complications are liable to appear. The effacement of the cervix and the dilatation of the os occur very slowly and unsatisfactorily, the bag of waters ruptures early, while, in addition, the contractions are irregular, shallow, ineffective, and extremely annoying to the patient. This is the second of deflexion positions and if flexion occurs at all, it is late. The labor is greatly prolonged. The head descends into the pelvis, and in course of time the occiput

frequently rotates, at least into the transverse (resulting in deep transverse arrest). It may, however, remain either obliquely posterior or rotate into the hollow of the sacrum.

To secure flexion and anterior rotation, a number of maneuvers have been advised.

a. Place the woman on the side toward which the occiput points.

b. Pressure upward on the sinciput during a pain to produce flexion, whereupon rotation will most probably occur (Hodge).

c. Or by passing two fingers or the half-hand behind the foetal ear, attempt to pull the occiput forward, while the other hand pushes on the forehead outside

d. De Lee. "A combination of internal and external manipulations. Flex the head from be-

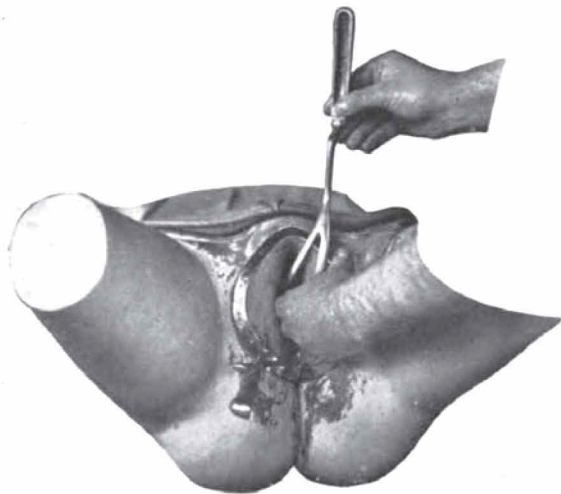


Plate XI. Axitraction instrument. Introduction of left (first) blade. Whole hand should be introduced if necessary to guide the blade.

low, then pull the occiput forward, both maneuvers with hand in the vagina. From the abdomen first dislodge the shoulder by extending the child's body; then pull the breech down, so as to flex the axis of the foetus strongly; then pull the shoulder to the front by operating on the back. Hold what you have gained, and repeat the manipulation if necessary. If the head can be pushed up, as it usually can be, so as to allow the inside hand to pass the promontory and reach the shoulder, the fingers may swing the child's trunk around so as to bring the back anterior. The occiput will now remain anterior."

If these maneuvers fail or if some indication arises for the termination of the labor, the forceps should be applied.

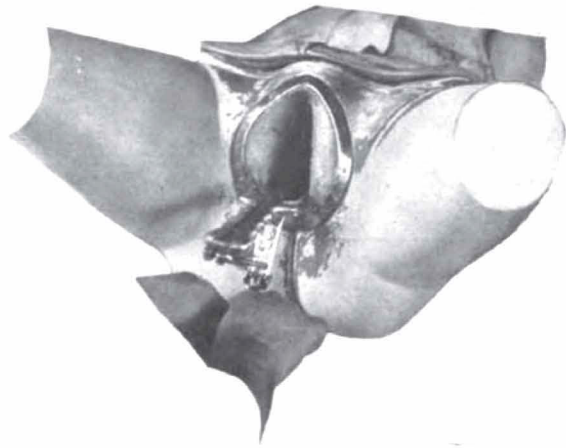


Plate XII. Blades adjusted and bar grasped by the hands for traction.

If the head lies in the right or left oblique posterior, the forceps are applied to the sides of the pelvis as usual, and traction is made horizontally. This will result usually in slight flexion and some anterior rotation, which may bring about a transverse position of the head, whereupon the forceps should be removed and reapplied as for deep transverse arrest.

If, on the contrary, the occiput, during the maneuver, should rotate backward into the hollow of the sacrum, an attempt must be made to deliver the head in flexion.

The forceps are now applied to the sides of the pelvis and grasp the sides of the foetal head. The front of the forceps is directed toward the forehead, which now becomes the point of direction. Traction is made upwards from the horizontal

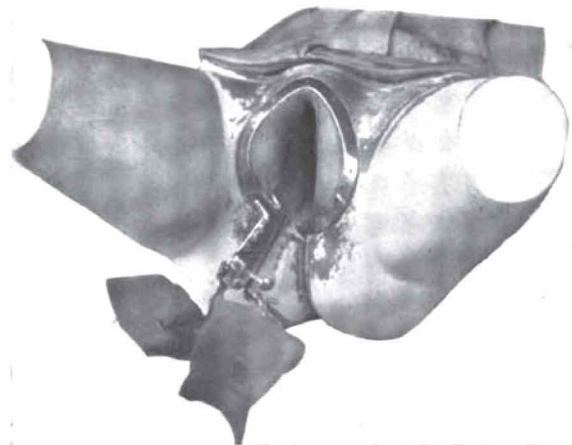


Plate XIII. Rotation occurring as an effect of traction.

plane, in an effort to deliver the occiput over the perineum. The traction is carried more and more upward, the perineum bulges enormously, and probably tears, and as soon as the flexion of the head is sufficient, the occiput will deliver over perineum, and immediately the handles are *depressed* to the perineum to deliver the face from under the pubes.

If this maneuver does not succeed, Scanzoni's method may be attempted. The forceps are applied to the sides of the pelvis if possible, but for the safety of the mother the blades should grasp *closely* the sides of the foetal head, the front of the forceps looking toward the face of the child. Traction is now made downwards until the occiput impinges on the pelvic floor, when a rotary motion is imparted to the blades, in addition to traction, whereby the occiput is slowly and intermittently rotated with the utmost care, first into a transverse and then into an occipito-anterior position. The forceps now lie upside down, and should be taken off and reapplied to the sides of the pelvis, and also to the sides of the foetal head. The front of the forceps will now look toward the occiput, and the delivery will proceed according to the rules as first laid down. Axis-traction forceps may be used in these cases, and episiotomy should be done if necessary.

FACE-PRESENTATION

These cases nearly always will terminate spontaneously, if given time enough; hence no interference is indicated until danger to mother or child threatens.

The first and second stages of the labor are greatly prolonged; the head seems to be engaged long before the biparietal diameter has passed the inlet.

The anterior rotation of chin does not occur until the face is well down on the perineum, and it takes a very long time, but this rotation *must* take place, and the chin *must* reach a point anterior to the transverse diameter of the pelvis, for otherwise the labor is greatly prolonged and many complications are liable to arise which imperil both mother and child, and may easily cause a condition *impossible* of delivery.

The craniotomy set should be boiled with the rest of the instruments.

Where the chin is fully rotated, the introduction of the blade takes place as usual, but the second step differs materially.

The adjustment *usually* is secured by depressing the handles until the two members of the lock come into apposition, when they are slipped together; in face cases, however, the handles are

raised toward the symphysis until the blades, sinking deeply into the hollow of the sacrum, grasp the parietal bosses, then the two members of the lock come into apposition and the adjustment can be made. (Plate X.) The front of the forceps looks toward the chin.

Third step. Traction carefully *downward* until the chin in forced extension is brought well under the symphysis, and then the handles are carried upwards to deliver the occiput. These actions are just the reverse of the motions used in delivering the head in an occipito-posterior position.

In cases where the chin is not fully rotated to the front, the conditions met with are practically the same as in deep transverse arrest, but much more serious for the child. The application is made as described under deep transverse arrest, except that the blade which passes over the face is carried directly into position to avoid rotating it over the face and neck.

The blades grasp the head from forehead to chin, which is extremely dangerous for the child, on account of the possibility of fatal compression of the blood-vessels.

Traction must be made with extreme care, and frequent unlocking of the forceps.

Traction and rotation must be simultaneous, and governed by the same laws as in deep transverse arrest.

If child is dead, do craniotomy in behalf of the mother.

HIGH FORCEPS

The axis-traction instrument is used by many obstetricians for *all* operations in which forceps are required.

In the hands of good operators, such use is not unsatisfactory, and in the hands of a poor operator, or of one who does not or cannot make an accurate diagnosis of the position of the head, it has obvious advantages, since it is applied rigorously to the sides of the pelvis without reference to the position of the head. Thus the mobility which the perfection of the instrument confers upon the head in a measure compensates for the failings of the operator, and relatively less injury may be done to the patient in a certain percentage of cases.

The intent of the instrument is twofold and both are fulfilled. It confers upon the operator the ability to make traction in the axis of the inlet, and it confers upon the head a certain amount of mobility.

It is therefore evident that its greatest value will be found in those cases where the head is fixed in the inlet and where after prolonged labor

it seems possible to help the head into the pelvis by traction (*vis à fronte*), or where the head is fixed in or somewhat below the inlet, and some indication arises on the part of mother or child to terminate the labor.

The forceps should *not* be applied to the head floating above the inlet, unless version is impossible and some necessity exists for rapid delivery.

The conditions and preparations given previously for the use of forceps must be observed with the minutest care in this operation, for great injury may be produced upon mother or child, or both.

APPLICATION

The right hand is carried into the vagina, and through the cervix to the left side of the head as it lies in the pelvic inlet. The left blade in the grasp of the left hand is passed along the flexor surface of the right hand as a guide until the cephalic curve receives the head. (Plate XI.) The right blade is now passed in a similar manner, the left hand being introduced to serve as a guide. The blades now lie in the sides of the pelvis, to which the pelvic curve of the instrument readily adapts itself. The head, however, is usually grasped in the antero-posterior diameter, or very near it.

Second step. *Adjustment* is executed exactly as for low forceps.

After the adjustment the blades are locked by the thumb-screw, which holds the blades of the instrument firmly and prevents disarticulation. Next, the transverse bar with the universal joint

is applied to the metal arms, which descend from the attachments back of the fenestræ in the Felsenreich model.

Third step. Traction is made on the horizontal bar entirely, and in such a direction that the portions of the descending bars which run parallel with the application handles will lie almost in contact with the application handles. The first traction is a trial traction, to see if the blades hold and are properly adjusted. (Plate XII.)

The patient may be then placed in Walcher's position, and eight tractions are allowable, assisted, if necessary, by the compression of the head from above by an assistant, who endeavors, at the time traction is made, to press the head through the inlet by means of a hand placed upon the head above the pubes. (Wiegand.)

When the head passes the inlet, the normal rotation begins (Plate XIII), and as it reaches the outlet, rotation being complete, the forceps may be taken off and reapplied to the sides of the child's head, or Simpson forceps substituted.

In some cases the forceps may be removed and the natural forces complete the delivery.

After the head passes the inlet, the woman is restored to a dorsal position on the table, with thighs elevated, and the case is managed according to the principles laid down for low forceps.

The application of forceps under strict indications and carefully observed conditions has a surgical importance equivalent to an amputation above the knee, and should not be entered upon or attempted without equivalent preparations and safeguards.