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## Midforceps operation

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**MIDFORCEPS OPERATION**

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# MIDFORCEPS OPERATION

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## Introduction:

The introduction of the forceps into obstetrics is not a new concept, but its use has certainly been a controversial subject; one which even today does not find all obstetrical authorities in full agreement. The obstetrical forceps was invented by a French Huguenot refugee named Peter Chamberlin, Senior, who came to England about 1569. Chamberlin kept his invention quite well concealed for many years perhaps because of fear of criticism from the public or from the medical profession. However, at the start of the eighteenth century the forceps became a familiar instrument. Edward Chapman, who published the first account of the forceps in 1733, stated that there were many sorts of forceps and that they were well known. The first American forceps was introduced in 1812 by Thomas Chalkley James of Philadelphia. Many hundreds of modifications have been made since, but the vast majority are now of merely antiquarian interest.

There are certain prerequisites of any forceps delivery which are of vital importance and which need to be emphasized. Dennen lists them as follows: the head should be engaged; the cervix should be fully dilated; the exact position of the head should be determined; the type of pelvis should be known; the operator should be familiar with the advantages and disadvantages of the different types of instruments and the technique of their use. Exceptions to these requirements exist, but they are rare and such circumstances which will warrant the ignoring of these rules will not be encountered frequently.

Definition:

It is the general concensus of opinion among the leading Obstetrical authorities in the country that the criteria for classifying midforceps operations need to be revised. The definition of a type of forceps operation must include reference to a fetal and a pelvic plane which are ascertainable and constant. At present a midforceps delivery is defined by many obstetricians as an obstetrical operation by which a fetus which presents cephalically and whose presenting part is located between the planes of the ischial spines and the ischial tuberosities, is delivered by forceps. In this definition the most dependent portion of the fetus is used as the fetal point of reference. But since the biparietal diameter of the fetal head is usually the widest diameter which must pass through the maternal pelvis, its location is of greatest importance. Extreme molding lengthens the long axis of the head, thus the leading point may be at the plane of the ischial spines and the biparietal diameter at the inlet. Similar abnormalities may be seen in extension of the head and asynclitism. The long distance from mid to high pelvis have led to humerous errors in classification and to attempts at forceps delivery on unengaged heads. Without a systematized classification, there is a great void between the low forceps, in which the head is visible, and the midforceps, which may be anything from a simple low-midforceps to a complicated delivery of a head at the inlet. This is one reason why the true midforceps operation has fallen into discredit.

The logical approach to the problem is to relate the station

of the head (the biparietal diameter) to the four major planes of the pelvis. They are; (1) the plane of the inlet (superior strait) which is bounded by the promontory of the sacrum and the upper inner border of the symphysis; (2) the plane of greatest pelvic dimensions (mid-plane which extends between the middle of the inner border of the symphysis and the junction of the second and third sacral vertebrae; (3) the plane of least pelvic dimensions (plane of ischial spines) which is bounded anteroposteriorly by the lower inner border of the symphysis and the sacro-coccygeal joint, and laterally by the ischial spines; (4) the plane of the outlet, quadrilateral in shape, which is bounded by the sacrococcygeal joint, the ischial tuberosities, and the inferior border of the symphysis. The corresponding operative deliveries could be entitled high, mid, low-mid, and low forceps. This proposed classification by Dennen had received favorable comment by many obstetricians, but some alterations may be necessary before it will be universally accepted. It is a recognized fact that the exact level of the biparietal diameter may be difficult to make without a vaginal examination and X-ray studies, but the importance of this additional information before attempting a midforceps operation should make them mandatory. In face and brow presentations, the biparietal diameter is not the greatest diameter involved in the mechanism of labor and exception will need to be made in such conditions.

A midforceps delivery may then be defined as one done on a head, the leading bony part of which is at or just below the plane

of the ischial spines with the biparietal diameter below the superior strait. The head nearly fills the hollow of the sacrum.

A low-midforceps delivery is one in which the biparietal diameter is at or below the plane of the ischial spines with the leading point within a fingerbreath of the perineum between contractions. The head completely fills the hollow of the sacrum.

#### Indications:

It is the feeling of most authors that labor is not an endurance test between mother, baby and doctor. It is alright to watch a patient for certain progress, but one should be prepared to recognize when this is accomplished.

The principal indication for the use of forceps is failure of labor to progress in the second stage after a reasonable period of time. There are other factors, however, which are also of vital importance in the final analysis and these will receive consideration subsequently. There is no complete agreement amongst obstetricians of the exact time limit that should be employed. Decker suggests a limit of one hour in a multipara and two hours for primipara in second stage labor without progress. Results of such deliveries in his series of 547 midforceps deliveries make it difficult to justify further prolongation of the uterine contractions, except in most unusual circumstances. This concept, as to time limit, is generally accepted in most obstetrical circles.

Other factors which should be considered and which are usually helpful in confirming the advisability of mid-forceps operations include pelviradiography, rupturing of fetal membranes, use of oxytocin and trial forceps. By the use of pelviradiography several

things are accomplished. First, it helps the obstetrician in verifying the location of the presenting part, and especially the level of the biparietal diameter. Secondly, this will rule out pronounced pelvic contractions and almost eliminate cephalopelvic disproportions. The knowledge of pelvic architecture aids in proper selection and execution of the forceps operation.

Weinberg reports a series of 1000 midforceps operations in which pelviradiography was done on nearly all the patients and which resulted in a fetal mortality of 0.5%. In this study patients with a contracted pelvic inlet, with or without a relative or borderline disproportion, or those with a midpelvic index of less than 13.5 cm. were delivered abdominally if they were full term. A similar study by Steer on 227 midforceps deliveries in which 70% were delivered because of pelvic disproportion, resulted in a fetal mortality of 5.3%. This clearly illustrates the importance of pelviradiography in determining advisability of midforceps operations.

In the same series of 1000 cases, Weinberg states that if the second stage contractions are weak, progress may well be unexpected within the prescribed time limit. Instead of waiting longer, after one hour he prefers to stimulate the second stage contractions by rupturing the membranes if they are still intact. If after one-half hour the contractions are still not powerful, he uses oxytocin injection (Pitocin) hypodermically in doses of 1 to 2 minims every 20 minutes for one hour or an intravenous infusion of dilute oxytocin injection. If the contractions fail to result in descent and rotation, the time indication for midforceps delivery



is invoked. The maternal mortality in this series was 0% and the fetal mortality was 0.5%.

Douglas and Kaltreider have advocated "trial forceps" in mid-pelvic arrest since bony disproportion represents only one cause. Malposition of the fetal head or uterine inertia being two others frequently delivered vaginally. This consists of applying forceps and using "undue force" which is referred to by Strother as "the amount of force which can be applied to the forceps with the rollers of the table unlocked without moving the table". Moen and Wall report a series of 131 midforceps operations in which trial forceps were used routinely. In this group, eleven cases failed and were sectioned. None of these resulted in stillbirth or neonatal injury or death. X-ray pelvimetry had been done on all but two of these patients before trial forceps were applied. It is a well recognized fact that trial forceps are not used routinely in obstetrics and more studies of their value will need to be done before a full evaluation can be made. But in areas where they are used, the reports seem quite favorable.

If the criteria as set forth in the definition of mid-forceps operation are met, and if all the above listed factors have received due consideration and trial without results, and if there is no sign of fetal or maternal distress which would require other treatment, midforceps operation may be considered.

Some of the underlying causes of midpelvic arrests have already been mentioned above, but many more are enumerated in the literature. The most common causes in order of their frequency are:

1. Malposition-

- (a) Occiput posterior (commonest).
- (b) Occiput transverse.
- (c) Occiput anterior.

2. Contracted pelvis.

3. Prolonged labor.

4. Fetal distress.

5. Soft tissue dystocia.

6. Maternal distress.

7. Elective.

Some of the other less common causes include toxemia, posterior face presentation, impacted shoulder, uterine inertia, cervical rigidity, large baby and vaginal wall cyst. The order of frequency of these causes will vary in different studies, but by and large this order is acceptable.

Choice of Forceps:

The selection of forceps is of utmost importance. It is difficult to believe that all mid-pelvic arrests can be treated with a single instrument. The often quoted advice to learn to use one type of instrument well and to forget the rest, is utter nonsense. Instruments are available specially designed to provide the most effective axis traction with the head in the transverse diameter (Bartons); particularly designed for rotation (Kielland); and for delivery of the head in the anterior-posterior diameter (the classical forceps). Further elaboration on the various forceps and their uses is beyond the scope of this paper, but suffice

it to say that provided the operator is aware of the varying factors involved in midpelvic arrests and possesses a knowledge of the fetal head, delivery can be accomplished with very little or no risk to the mother and fetus, provided suitable instruments are selected.

**Results:**

In an effort to evaluate more fully the usefulness of the midforceps operation, a review of the midforceps deliveries reported in the literature since 1950 was done. A total of 3,528 cases were reviewed from seven separate series. The separate statistical findings are included in table 1. together with an average percentage for the total cases reported. Most of the reports had indicated that the figures were corrected according to standards set forth in the various hospitals.

TABLE 1.

Number of Cases	Fetal Mortality	Fetal Morbidity	Maternal Mortality	Maternal Morbidity
1. 1000	(6) 0.60%	(6) 0.60%	(0) 0.00%	(78) 7.80%
2. 351	(1) 0.29%	(0) 0.00%	(7) 2.00%	(175) 50.00%
3. 527	(12) 2.27%	(0) 0.00%	(0) 0.00%	(12) 2.28%
4. 31	(8) 26.00%	(7) 22.00%	(0) 0.00%	(16) 51.90%
5. 65	(0) 0.00%	(5) 7.70%	(0) 0.00%	(10) 15.30%
6. 547	(26) 4.75%	none reported	(1) 0.05%	(72) 13.10%
7. 1808	(16) 0.85%	none reported	(0) 0.00%	(14) 0.77%
<b>Total-3,528</b>	<b>(69) 1.95%</b>	<b>(18) 1.53%</b>	<b>(8) 0.22%</b>	<b>(377) 10.68%</b>

In table 11. are listed the causes of fetal and maternal mortality and the types of fetal and maternal morbidity. All of the series are not represented in each category because of their failure to report these statistics.

TABLE 11.

Fetal Mortality	Fetal Morbidity
<ol style="list-style-type: none"> <li>1. Asphyxia               <ol style="list-style-type: none"> <li>(a) Cord strangulation</li> <li>(b) Cord Prolapsed</li> </ol> </li> <li>2. Intracranial injury.</li> <li>3. Atelectasis.</li> <li>4. Prematurity, pneumonia.</li> </ol>	<ol style="list-style-type: none"> <li>1. Cephalhematoma.</li> <li>2. Facial paralysis (transient).</li> <li>3. Birth trauma.</li> </ol>
<p>Maternal Mortality</p> <ol style="list-style-type: none"> <li>1. Hemorrhage.</li> </ol>	<p>Maternal Morbidity</p> <ol style="list-style-type: none"> <li>1. Cervical laceration.</li> <li>2. Laceration of bladder.</li> <li>3. Perforation of uterus.</li> <li>4. Dihrssens incisions.</li> <li>5. Vesicovaginal fistula.</li> <li>6. Hemorrhage (over 500 c.c.).</li> <li>7. Rectovaginal fistula.</li> <li>8. Urinary retention.</li> <li>9. Vaginal laceration or hematoma.</li> <li>10. Puerperal fever.</li> <li>11. Post partum pyelitis.</li> </ol>

The fetal mortality varied from 0% noted in 65 cases reported by Morgan and Reyes to 26% reported by Taylor. The overall fetal mortality was only 1.95% in 3,528 cases. Studdiford and Decker reported that the gross fetal mortality in cesarean sections between 1942 and 1951 was 8.8% and corrected to 6.2%. With present day improvements in anesthesia and surgical technique this figure may well be lower, but it would be highly questionable that it could approach the figure of 1.95% seen with midforceps operations. The series reported by Taylor would tend to indicate

that midforceps operations should be eliminated. In the last 10,055 consecutive deliveries at Colorado General and Denver General Hospitals, Taylor reports the midforceps was used only 31 times. Primary uterine inertia or a delayed second stage with arrest of the head at the midpelvis were prominent features in 25 of the 31 cases. Secondary inertia from anesthesia was the cause of arrest of progress of 4 more. During this same period of study cesarean section was performed 28 times on patients with obstetrical problems which paralleled those delivered by midforceps. There was no mortality or morbidity among the infants, no maternal mortality and no serious maternal morbidity.

Since uterine inertia was a prominent feature in Taylor's series and since his fetal mortality and morbidity were so high, one might conclude that these factors are related. Eastman states that the best treatment for primary inertia is time. Other means of treatment include repeated encouragement and reassurance of the patient, stimulation with enemas, postural therapy and artificial rupture of membranes. If the inertia is refractory to these methods, Eastman feels that pituitary extracts used properly should be employed. Failure of this method occurs in about 10% of uterine inertia. Provided the head is engaged and the cervix is 6 Cm. dilated. Dehrssen's method of incision and forceps delivery is generally the choice. If the head is high and/or the cervix is less than 6 Cm. dilated, cesarean section is justified. In Taylor's own series, cesarean section

proved to be preferable over midforceps in uterine inertia. This would support the theory that perhaps midforceps should seldom or never be used in uterine inertia.

In secondary uterine inertia the therapy is primarily the use of morphine sedation and intravenous glucose. If these measures fail cesarean section or Dührssen's incisions, as discussed above, are preferable according to Eastman.

These facts may help to explain the relatively high fetal mortality seen in Taylor's series even though the full details describing the procedures followed in the deliveries were not reported.

The fetal morbidity statistics are not remarkable, except for the series by Taylor. An overall average of 1.53% is sufficiently low to advocate the use of the midforceps. The maternal mortality is similarly low.

The maternal morbidity however, of 10.68% is much higher than would be desirable. Many of the causes listed under this heading in Table 11. are perhaps not directly due to the use of the midforceps and others could perhaps be avoided by employing proper forceps, and by more careful evaluation of the pelvis and the cervical dilatation.

#### Physical and Mental Development:

Many of the mental and physical defects seen in children and adults have been attributed to injury inflicted at the time of delivery, especially when forceps were used. Among these de-

fects are such conditions as cerebral palsy, epilepsy and mental retardation. There is a sparsity of reports in the recent literature concerning the frequency of mental or physical defects following midforceps operations primarily because follow ups are difficult. However, one study was done recently by Corston at Grace Maternity Hospital, Halifax, Nova Scotia in which 73 midforceps deliveries and 75 controls were compared. These patients were delivered between 1922 and 1936. Each subject was submitted to a full physical examination and to psychological evaluation. The psychological tests consisted of the Wechsler-Bellvue Intelligence Scale and the Bell Adjustment Inventory which tests the individual's adjustment in a variety of areas; home, health, social, emotional and occupational. From the results gained in this study, it was stated that not one case of epilepsy was found and that there was no significant difference in the psychological tests compared to the control group.

Eastman and De Leon reviewed 96 cases of cerebral palsy delivered at John Hopkins University and Hospital. A group of 11, 195 children born between 1945-49 were used as a control series. Most of the cerebral palsies were born during the same period as the controls. Of the cerebral palsy group, 6 were delivered by midforceps (6.3%), and 4 (4.2%) were delivered by cesarean section. Of the control group, 2% were delivered by midforceps (224) and 4.6% by cesarean section (515).

In a series of 204 midforceps deliveries performed by Klein, a follow up of their growth and development was done at 6 and 18

months following delivery. One was reported as slow in development and growth and one was mentally retarded. All others were reported as making normal progress.

From these reports it may be concluded that mental and physical defects seen in children and adults are not significantly influenced by the use of the midforceps operation. Mechanical trauma, of whatever nature, is unquestionably responsible for a certain number of cerebral palsies, but in present day practice the role it plays is certainly much less than was hitherto thought.

**Summary:**

In this paper the factors which should influence the advisability of the midforceps operation and the results from 3,528 cases have been discussed. The four separate pelvic planes were described and a new definition for midpelvic operations, as described by Dennen, was proposed. This is felt necessary to avoid error in classification and to avoid attempts at forceps delivery on unengaged heads.

There are many conditions in which a midforceps operation may be indicated, but the most common one is malposition, such as occiput posterior, anterior or transverse. Before any midforceps operation is attempted, there are several other factors which must carefully be considered. These factors include (1.) an adequate period of time in second stage of labor; (2.) the use of pelviradiography; (3.) rupturing of fetal membranes; (4.) the use of oxytocins; (5.) and trial forceps.



After it is apparent that a midforceps operation is definitely indicated, the proper selection of the forceps becomes of paramount importance. If the operator selects the correct type of forceps and is aware of the pelvic architecture, the operation is performed with little or no risk to fetus or mother.

The results obtained in 3,528 cases of midforceps deliveries have been reviewed. These cases were reported in 7 separate series. The fetal mortality varied from 0% in 65 cases to 26% reported in a series of 31 cases. The overall fetal mortality in the 3,528 cases was 1.95%. This figure compared quite favorably with the fetal mortality reported in cesarean sections of 6.2% between 1942 and 1951.

The overall fetal morbidity for the 3,528 cases was satisfactorily low at 1.53%. The maternal mortality was only 0.22% in the same number of cases. The maternal morbidity overall was 10.68% which is much higher than would be desirable. However, it is felt that many of the causes for the morbidity are not directly due to the midforceps operation, but might occur in any type of delivery.

Obstetrics has been blamed for centuries for the cerebral palsies, epilepsy and mental defectives. Although little work has been done in this field, one report by Corston in Nova Scotia in which 73 midforceps deliveries were compared with 75 controls, showed not one case of epilepsy and no significant difference in psychological and physical examination. In another study Eastman and De Leon reviewed 96 cerebral palsy patients along with

11,195 controls. Of the Cerebral Palsies 6 (6.3%) were delivered by midforceps and 4 (4.2%) by Cesarean section. Of the controls 2% (224) were delivered by midforceps and 4.6% (515) by cesarean section. These reports tend to indicate that little influence on mental and physical defects would be expected in midforceps operations.

#### Conclusion:

There is a tendency by some authors in the current literature to urge almost complete elimination of the midforceps operation. D'Esopo states that only by reduction of the midforceps incidence to 0.5% and increase of the cesarean section rate to 6% will it be possible to eliminate birth trauma to mother and babies and maintain a preventable term fetal loss of 1%. Taylor, in the report of his recent series, states that the midforceps operation may have little or no place in modern obstetrics.

However, in this paper the results reported in 3,528 midforceps operations from 7 separate series have been compiled. These operations were performed for various reasons and under a variety of different circumstances. None the less, the overall fetal mortality was only 1.95%. The corrected fetal mortality in cesarean sections between 1942 and 1951 was 6.2%. It would seem safe to conclude that replacement of midforceps operations by cesarean section is not the answer in lowering fetal mortality. Furthermore, it does not seem reasonable to

conclude from these statistics that the midforceps operations should be eliminated.

If such be the case, and if the fetal and maternal mortality and morbidity are to be reduced in midforceps operations, then it becomes of vital importance that certain essential factors be carefully considered before the midforceps is used.

These factors may be summarized briefly as follows:

- (1.) The obstetrician must have a clear understanding of the definition of midforceps delivery so that high forceps deliveries or deliveries on unengaged heads will not be done in error and subsequently increase the risk of a successful procedure.
- (2.) At least 2 hrs. in primipara and one hour in multipara must be allowed in second stage of labor without progress before other methods are initiated.
- (3.) Rupture of fetal membranes to stimulate labor. This may be done occasionally during the above(2.) time period.
- (4.) Pelviradiography very informative as to cause of the arrest of progress. It also demonstrates the pelvic architecture, should forceps be necessary.
- (5.) Determination of the cause of arrest of progress.
  - (a) Pelviradiography.
  - (b) Vaginal examination.
  - (c) Complete evaluation of the patient.
- (6.) Use of Oxytocin.
- (7.) Selection of the proper forceps.
- (8.) Trial forceps.

Each case must necessarily be individualized and good obstetrical judgement must be applied. If the obstetrician has obtained the full benefit of these suggestions, as applies to a particular case, and if midforceps are still indicated, the procedure would be adviseable with minimal expected risk to mother or fetus.

The much proclaimed theory that many of the physical and mental defects seen in children and adults are due to trauma at time of delivery is not so well supported today. In this paper, we are primarily concerned with reports following midforceps deliveries. The results of several recent studies which were done to determine mental ability as well as the frequency of epilepsy, cerebral palsy or other physical defects, showed no significant prevalence in midforceps deliveries as compared to control groups. Mechanical trauma as may be encountered in cesarean section or forceps deliveries may well be contributory to certain mental defects, but these factors, instead of acting alone, usually synergize with other factors so that three or four may be active in a given case without any rational basis for deciding which is the most culpable. Adherence to the above suggestions in midforceps operations may well reduce the possibility of trauma, in any case, and therefore consideration of these suggestions becomes even more essential.

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