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DOES CESAREAN SECTION INSURE SAFETY FOR THE BABY

BY

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INTRODUCTION

Someone has said that the average individual is never again placed in such jeopardy of both life and limb as during his passage through the birth canal. If he survives the plain mechanical hazards of being forced through a passageway which is frequently too small for him, under a pressure of something like twenty-five pounds per square inch, he has still to face the dangers of asphyxia, anesthesia, narcosis and infection.

In recent years there has been a decided increase, in certain clinics, in the incidence of operative intervention at the time of birth of the fetus. One explanation for this so-called radical obstetrics is said to be due to the great emphasis that is being placed on obtaining a living and healthy infant. Opinion is sharply divided as to whether the operative methods employed are accomplishing this end. The difference in opinion has been based largely on a mass of statistics, the value of which has been limited by the failure in most instances to base results on comparable data and by the almost universal failure to test results by statistical methods. A significant part of this new "operative furor" in obstetrics is due to the increasing use of cesarean section in certain clinics.[1] It is a well established fact that in any type of statistical survey, figures and percentages can be used to prove or disprove any preconceived fact. Without attempting in any way to ascertain the part cesarean section should or should not play in obstetrical management, the fetal and neonatal mortality in a series of cases have been investigated, with the purpose of determining the relative safety of this method of delivery for the fetus. In a major part, this will be attempted by correlating the outstanding significant findings of several investigators.

HISTORY OF CESAREAN SECTION

To consider the removal of the child from the uterus through an incision in the abdominal wall is to consider one of the earliest historical surgical procedures. Cesones, or children thus delivered from dead mothers, were known at least 715 B.C. as evidenced by the Lex Regia of Numa Pompilius.

The derivation of the term "Cesarean" section periodically comes up for discussion in both medical and classical journals. The most persistent belief, doubtless still shared by a distressingly large proportion of modern medical students, if not of modern surgeons, is that the operation was named after Julius Caesar, who was brought into the world in this way, or at least that it refers to a law of Caesar directing that the fetus be removed from a pregnant woman who died before giving birth to a child. In a book published just nine years ago (creditably to the profession, so far as this error is concerned, it is not a medical book), it is stated clearly and quite incorrectly that a cesarean operation was performed "in the case of Julius Caesar".

This whole tradition is inaccurate. Not until long after the days of Julius Caesar (102-44 B.C.) was the operation successfully performed on a living woman, and it is a matter of historical record that his mother, Julia, lived for many years after his birth. That fact effectively disposes of the myth that the operation takes its name from the method of Julius Caesar's birth. The reference to a law of Caesar is probably due to a confused recollection of a provision of the Justinian Law Code, quoted by Marcellus, to the effect that a royal law forbade that a woman who had died in pregnancy should be buried before the fetus had been cut out. The

Justinian Law Code, however, dates many years after the death of Julius Caesar.

Trautman of Wittenberg in 1610 is credited with having performed the first generally accepted cesarean section, although there are some records indicating that J. Nufer, a swinegelder in Switzerland, had so delivered his wife in 1500. F. Rousset, in 1581, published a monograph reviewing fifteen cases, but it is doubtful as to whether they were all authentic cesarean sections. That Shakespeare was familiar with the operation is seen in Macbeth, Act V, Scene VII, for Macduff says:

> "Despair thy charm
> And let the angel whom thou still hast served
> Tell thee, Macduff was from his mother's womb
> untimely ripped."[2]

Kayser, in Copenhagen, in 1844 reviewed the medical literature for the preceding eighty years and found that the mortality of this operation was over sixty-two per cent. Fornier is quoted as stating that there was not one successful cesarean section in Paris in the entire nineteenth century up to his time, and Spaeth made a similar statement in Vienna in 1877.

In this year also Porro of Pavia, devised his operation of supravaginal amputation of the uterus following section. This was supplanted by Sanger's operation in 1882, from which our modern technique is largely evolved. With progressing methods of control of hemorrhage and the employment of absorbable sutures, the rubber ligatures used about the cervix to check hemorrhage and the use of silver wire sutures in the uterus, practiced originally by Sanger, were gradually abandoned. Apparently there has been

little change in the actual technique in the performance of cesarean section for the past twenty years.

With the experience of having many years in the obstetrical field as a background, professors of obstetrics, such as De Lee and Williams, have been developed, and it is, in major part, through their efforts and teaching that the practice of obstetrics in the United States has reached its present status.

FACTORS INFLUENCING MORBIDITY AND MORTALITY

The studies that have been made of deliveries by cesarean section have dealt primarily with the effects of the operation on the morbidity and mortality of the mothers. The effects on the infants have received only secondary consideration and have been studied only in regard to mortality. The infant mortality statistics recorded during the ten year period from 1930 to 1940 in eighteen obstetrical clinics in several large clinics in several cities in this country are shown in Table I. While the total mortality rate of 8.8% in 10,563 sections is a fair estimate of the average mortality rate for the operations done in hospitals in large cities, there is no basis for judging whether the rate of 8.8% is higher than that of infants born in these hospitals by other methods, since the figures for making such a comparison were not included in any of the reports in Table I.

INFANT MORTALITY IN CESAREAN SECTIONS REPORTED FROM 18 CLINICS IN THE UNITED STATES

			Infant Deaths							
			Fetal** and Neonatal		Fetal		Neonatal			
	Deliveries	Infants	No.	%*	No.	%*	No.	%*	Full Term	Premature
Phaneuf[2]	418	423	25	5.9	14	3.3	11	2.6	6	5
Detroit[3]	203	203	25	12.8	10	4.9	16	7.8	11	5
Boston[4]	436	443	42	9.6	16	3.6	26	5.9	9	17
Chicago[5]	874	887	40	4.5	9	1.0	31	3.5	21	10
Chicago[6]	500		31	6.2	14	2.8	17	3.4	3	14
Brooklyn[7]	733		47	6.4	18	2.4	29	3.9	7	22
Rochester[8]	165		7	4.2	1	0.6	6	3.6	0	6
Brooklyn[9]	359		22	6.1	1	0.2	21	5.6	3	18
Brooklyn[10]	1,805		162	8.9	111	6.1	51	2.8		
Hartford[11]	444		68	15.3	23	5.1	45	10.1		
Atlanta[12]	220	225	37	16.8						
New Orleans[13]	291		55	18.9						
Evanston[14]	124		4	3.4						
Chicago[15]	381	386	19	4.9						
Philadelphia[16]	573	576	74	12.9						
Los Angeles[17]	1,322	1,343	107	8.0						
Detroit[18]	154		17	11.0						
Boston[19]	1,561		152	9.7						
Total	10,563		935	8.8	217	3.6	253	4.2	60	137

*All percentages are calculated on the number of sections and not on the number of infants delivered.
**Fetal—Stillborn.

TABLE I

A. Comparison with other Types of Delivery.

Lund[3] in analyzing 2000 consecutive deliveries at the State of Wisconsin General Hospital noted that operative deliveries per se caused an increase in asphyxia, neonatorum. Table II Bears out this claim, with cesarean section playing a major part.

A Comparison Between the Type of Delivery, the Use of Analgesics,* and the Incidence and Severity of Asphyxia

Type of Delivery	No. of Cases	No Asphyxia %		Mild Asphyxia %		Mod. Asphyxia %		Severe Asphyxia %	
		No Analg.	With Analg.	No Analg.	With Analg.	No Analg.	With† Analg.	No Analg.	With Analg.
Spontaneous	1,329	91.5	82.5	5.5	6.0	2.0	10.0	0.7	1.0
Low forceps	349	89.0	73.0	5.0	10.5	4.0	13.5	2.3	2.5
Mid-forceps	36	85.5	67.0	0.0	0.0	9.5	33.0	4.5	5.5
Cesarean section	159	78.0	60.0	13.5	11.0	4.0	21.5	4.0	6.5
Breech	80	77.5	68.5	7.5	12.5	7.5	12.5	7.5	8.0
Version	24	44.0	67.0	25.0	0.0	25.0	0.0	6.0	33.0

*Types of analgesics are discussed later.
†Greatest increase in this group.

TABLE II

Bunkley[4] is of the opinion that a large per cent of stillbirths following difficult labors might be prevented by more accurate judgment on the part of the surgeon. He feels the mother in these selected cases would suffer no more physical discomfort from cesarean section than from delivery

from below, and she would be assured of a live baby.

Northrup[5] found in analysis of 5,679 deliveries that the infant mortality in cesarean section was almost doubled that seen in vaginal delivery. In 5,250 vaginal deliveries, there were 337 infant deaths, or a rate of 6.4%. There were 429 cesarean sections with 48 infant deaths, or a rate of 11.2%. From these results it would seem that cesarean section was more dangerous to the baby than the vaginal delivery. It is difficult to see how a section would be as hard on the baby as a vaginal delivery. However, the vaginal mortality certainly would have been higher had there been no sections.

In a study of 5,000 deliveries at the Woman's Hospital in Detroit, from 1936 to 1937, Cole and Kimball[6] concludes, as is seen in Chart I, that the degree of asphyxia in cesarean section as compared with the entire series on the whole was considerably increased, and that the results following elective section were much more favorable to the infant than those following section after labor. It should be pointed out that in the former, although the element of trauma is almost completely avoided, the factors of anesthesia and sedation are still present.

CHART I

Comparison of Morbidity and Mortality Rates Between Cesarean Section and Series as a Whole.

			Asphyxia %		Spontaneous %	
	No. Cases	Stillborn %	Severe	Mild	Delayed	Immediate
Cesarean Section						
Elective	108	1.8	15.0	4.7	5.6	72.9
After labor	64	1.5	21.0	6.3	12.5	57.8
Entire Series	5,000	1.9	9.4	6.5	9.2	72.8

Not all workers have taken the stand that cesarean section endangers the life of the baby. As early as 1901, Gummert and Hahn[7] were of the opinion that infants born by cesarean section were not endangered. Their remarks on the subject were: "That in the majority of instances infants delivered by cesarean section appear to be in a condition of asphyxia, that is they fail to cry or breath promptly after delivery, which they believe is not a real asphyxia. They also indicate that the infants find themselves in a condition of eupnea, since in no other form of delivery is the time period between the intra-uterine and extra-uterine life as short, and besides, the so-called cesarean asphyxia baby usually looks healthy. By waiting patiently a few minutes without administering artificial respiration, we will soon be rewarded by a lofty cry and normal respirations."

B. Effects of Anesthesia and Analgesia.

When artificial respiration is needed to resuscitate the infant, or pneumonia follows an initial respiratory difficulty, too often it is dismissed as due to toxemia or other hill health in the mother. In reality the type of anesthetic used for the operation plays a very definite part in the baby's start in life. No form of anesthesia nor method of resuscitation will save a baby with a very marked defect of brain or heart. It is doomed by congenital defects for which there is no remedy. Many others fail to survive the first few hours because respiratory mechanism is unable to function properly due to depression by anesthetics or sedatives. It is impossible to anesthetize or sedate the mother by inhalation or narcotics without anesthetizing the fetus. But most babies will withstand the terminal depression and breathe spontaneously, particularly if the oper-

ation is elective. The occasional one, however, is unable to cope with the depressing effect of the anesthetic and breathes only after resuscitation.

Most authors will agree that the use of morphine and its derivatives as a form of sedation in the mother has a marked depressant effect on the infant.

The generally known condition designated as apnea seen in cesarean section infants was questioned by Kustner[8] as to whether it was due to asphyxia or narcosis, and stimulated him to make a study of this question on experimental animals. He did a cesarean section on two rabbits and one guinea pig. The two operations on the rabbits were carried out without anesthetizing the animals, but they were given 0.01 Gm. of morphine ten minutes before operation. The guinea pig received neither anesthetic or morphine. After opening the abdominal cavity the gravid uterus was delivered and incised. The first of the rabbits had twins, thesecond rabbit had eight young ones. As soon as the first young was delivered, chloroform was administered. The second animal was deeply narcotized by the time the fourth young was delivered. The following was observed: The first few young ones which were delivered before narcosis was induced and following the separation of the placenta, were very active and their first respirations were regular, while the last of the young, of the narcotized animal were relaxed after delivery, bluish in color and reacted to skin stimulation with gasping respiratory movements. This was especially evident in the second animal which carried eight young. Each successive young one had a higher degree of relaxation and was of a gradually deeper blue color.

In the guinea pig the narcosis was administered late, but neither apnea nor asphyxia was observed, both young breathed immediately after delivery.

The author basing his opinion on these experiments in applying to the human, stated that many cases of asphyxia or apnea seen in infants delivered by cesarean section could be attributed to narcosis.

A study by Clifford[9] revealed that the mortality rate of infants having received morphine and its derivatives was twice that of those born to mothers not receiving the drug. It was further revealed that the mortality rate of infants born to mothers receiving morphine varies in direct relation to the amount of the drug given. Also that the infant mortality increases as the per cent of each group receiving morphine increases and that the maternal administration of morphine within four hours of delivery exerted a direct effect upon the death rate of the infants. This is shown in Table III.[10]

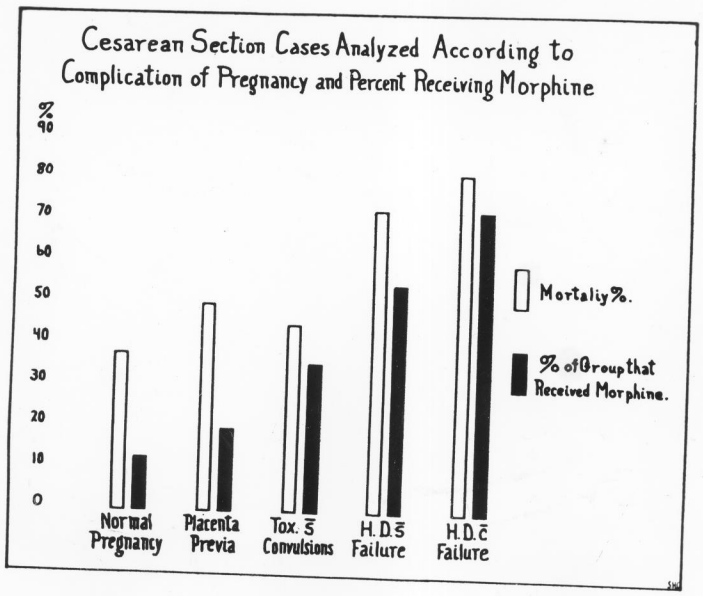


TABLE III

Cole and Kimball come to the same conclusion in their study of 5,000 cases. From their results, as seen in Chart II, they noted that the presence or absence of morphine, and if present, the time interval between administration and delivery played very important roles in the degree of asphyxia produced in the baby.

CHART II

Incidence of Asphyxia with Mothers Getting Morphine Sulphate as Against Those Receiving None

	Cases	Stillborn %	Asphyxia		Spontaneous %	
			Severe	Mild	Delayed	Immediate
Within 4 hours of delivery	81	6.2	34.6	7.0	12.3	38.3
More than 4 hours	147	0.01	17.7	8.8	15.6	57.8
No sedation	631	1.9	3.0	3.2	3.8	88.1

The incidence of severe asphyxia in those receiving no sedation at all, as compared with the entire series as a whole, was 3% and 8.6% respectively. The incidence of those who breathed spontaneously was 88.1% and 75% respectively, a very impressive difference.

In a series of 320 cases in 1932 Shute and Davis[11] stated that morphine or its derivatives were still the most useful and least dangerous of drugs. This was best studied in cesarean section because the time factor as to the administration of the drug was controlled, and the factor of trauma excluded. Size of the dose had little influence in production of narcosis in the baby. The time interval between administration and birth was the most important factor in neonatal narcosis. Few infants showed signs of narcosis if delivered after the first or sixth hour following administration

of the drug; narcosis became progressively greater between second or third hour, reaching the peak at three and one-half hours. Of twenty-six, twenty-five who were deeply narcotized were delivered within the limits of the first five hours.

These findings strongly substantiate the common opinion that opium derivatives, when administered within a few hours of birth, have a deleterious effect upon the infants.

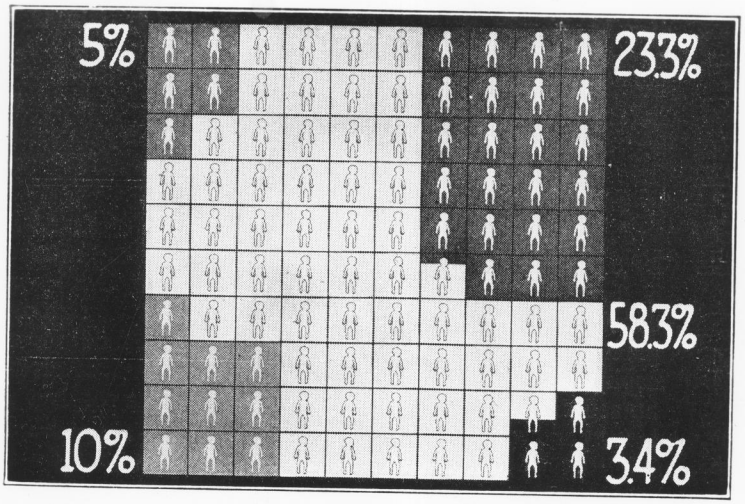
As regards the choice of anesthesia, there is considerable variation among the several investigators.

Owing to the popular use of nitrous oxide-oxygen in materal analgesia and anesthesia, special reference should be made to its action upon the newborn.[12] Eastman, Rosenfeld and Snyder,[13] Mc Cormick[9] have demonstrated its production of fetal anoxemia, and point out the risk of profound asphyxia when concentrations higher than 85.15 are employed. Eastman's study showed that when concentrations of 90.10 or stronger are employed over a period exceeding five minutes, one-third of the babies suffer a marked anoxemia, and occasionally profound asphyxia results.

From the viewpoint of anoxemia produced, cyclopropane with the customarily high percentage of oxygen seems to be a more practical analgesic agent than nitrous oxide-oxygen.[14] Sahler, Rosenfeld and Snyder were impressed with the fact that less resuscitation was needed with the cyclopropane oxygen mixture than with any of the other agents. As the uterus was opened, the patient was flushed with oxygen and the operator asked to refrain from clamping the cord if it was pulsating for a minute or two to allow the baby to become saturated with this high per cent of oxygen.

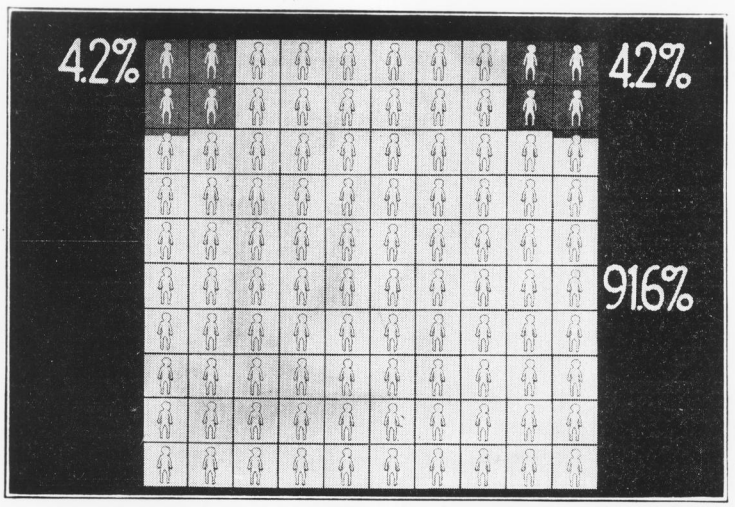
Eastman says, "Theoretically this is ideal, but it must be remembered that severe asphyxia can be produced with the use of cyclopropane and oxygen. Because of the marked capillary dilatation the blood passes through the capillary bed too rapidly, decreasing the supply to the fetus."

Several authors, such as Heard,[15] Cole, Kimball and Daniels,[16] harbor the belief that ether is definitely contraindicated, especially after a heavy sedation, and propose the use of spinal anesthesia. The most striking effect of ether anesthesia on the baby as contrasted to spinal anesthesia is seen in the one hundred and eight cases of elective sections done by Cole, Kimball and Daniels. Sixty cases were done under general ether anesthesia, with a high incidence of severe asphyxia and stillbirths, and a very low incidence of spontaneous respirations. Forty-eight cases were done under spinal anesthesia. These two groups are entirely comparable in every way, all factors of labor and delivery being eliminated, so that the striking results shown are clearly due to ether. Shown in Tables IV and V are the results, Table IV showing the effect of ether, Table V the effect of spinal. There are one hundred babies on each chart, with the corners being shaded to indicate the number of babies showing varying degrees of respiratory disturbance. The key to the Tables is as follows: Black square stillborn, dark grey severe asphyxia, lighter grey mild asphyxia, off white spontaneous delayed respiration, white spontaneous immediate respiration.



Elective cesarean section at full term with general anesthesia in sixty cases.

TABLE IV



Elective cesarean section at full term with spinal anesthesia in forty-eight cases.

TABLE V

The experimental work done by Rosenfeld and Snyder at Johns Hopkins University on the effect of anesthetics upon the fetal respiration warrants mention. Full term (32 days) rabbits were used for the experiment. Labor was inhibited by the injection of one c.c. of antuitrin S one week before term. Anesthesia of the lower abdomen for laparotomy was obtained by sectioning of the lumbar cord. Laparotomy was carried out beneath the surface of a bath of warm Ringer's solution and the gravid uterus was exposed. Topreserve the normal circulation, care was taken to avoid exposure of the uterus to the air and to prevent mechanical stimulation. Intra-uterine respiratory movements of the fetuses were clearly observed through the thin-walled uterus. The respiratory rate of various fetuses were recorded at repeated intervals, first during a control period, later during an experimental period following the administration of a given anesthetic. At the same time the degree of anesthesia of the maternal animal was noted. Fetuses were delivered at various intervals in order to determine the respiratory response associated with birth. Non-volatile anesthetic agents were injected in solution, slowly, into an ear vein of the mother. Volatile agents, except ether, were administered by tracheal catheter or cannula or by passage through a chamber sealed about the head of the animal.

The effect of these agents upon fetal respiratory movements was determined and correlated with the depth of maternal narcosis. The amount of anesthesia was gradually increased in order to determine the point at which suppression of fetal respirations occurred. The ultimate aim was to find out whether or not deep surgical anesthesia could be obtained without interruption of fetal breathing. Table VI shows the results of the

effect that the various anesthetic agents had upon fetal respiration.

EFFECT OF ANESTHETICS UPON FETAL RESPIRATION

ANESTHETIC	APPROXIMATE DOSE	NUMBER OF ANIMALS	NUMBER OF FETUSES	SURGICAL ANESTHESIA OF MOTHER	SUPPRESSION OF INTRA-UTERINE RESPIRATION OF FETUS
Pentobarbital sodium	20 mg./kg.	9	27	0	+
Morphine sulfate	5 mg./kg.	4	16	0	+
Paraldehyde	250 mg./kg.	3	5	0	+
Chloral hydrate	25 mg./kg.	2	15	0	+
Ether, open drop technique		3	8	0	+
Nitrous oxide 90% + oxygen 10%		3	10	0	+
Nitrous oxide 85% + oxygen 15%		4	15	0	0
Cyclopropane 30% + oxygen 70%		9	32	+	0

TABLE VI

The non-volatile anesthetics markedly depressed or completely abolished the fetal respirations at a level of dosage well below that required to anesthetize the mother. The maternal animal was still widely awake, responsive to external stimuli, and maintained normal respirations. The effect on the fetus was evident a few minutes following injection. Under narcosis, fetal respiratory movements may remain suppressed for hours, interrupted only occasionally by a feeble respiratory effort. Despite the prolonged apnea thus induced, delivery of the fetus from the uterus was promptly followed after a minimal depressant dose of anesthesia by resumption of active respiratory movements. This indicates that the fetal respiratory system during intra-uterine life is extremely sensitive to the depressant action of narcotics, but does not necessarily suffer irreversible damage. Although respirations return following delivery and often

approach normal, evidence of narcosis is manifested by the inactivity, sluggish movements and flaccid state of the new born.

Of the volatile agents, ether was unable to maintain surgical anesthesia in the mother without abolishing fetal respirations. If the maternal animal was allowed to awaken, the fetal respirations often reappeared following elimination of the anesthetic agent. Results of the nitrous oxide-oxygen mixture were influenced by the amount of oxygen available. If the proportion were 90:10, there occurred a rapid suppression of the fetal respirations, yet the maternal animal remained wide awake. After forty minutes of a mixture of 85:15 there was no depressing effect upon the fetus. This is best explained by considering the relatively great difference in oxygen tension in contrast to the small change in the proportion of nitrous oxide. With cyclopropane and oxygen deep surgical anesthesia could be reached and maintained without interruption of intrauterine respirations. As long as thirty minutes after delivery fetuses survived without complications and showed none of the striking signs of narcosis such as were previously noted in fetuses subjected to non-volatile anesthetics.

C. Prematurity as a Factor.

Theoretically, cesarean section should be the safest method of delivering a premature infant since it eliminates the factor of trauma. Yet, most reports on the delivering of prematures by cesarean section show mortality figures much higher than might be expected. Here, too often is forgotten the more dangerous factor of asphyxia which is introduced. Clifford made the statement that cesarean section carried the highest

mortality rates for the premature. In a study made by Beck[17] of 286 prematures delivered alive by cesarean section in New York, eighty, or twenty-eight per cent, died within the first month. These figures certainly do not favor supra-pubic delivery. Even when considered from the standpoint of various weight groups, results are disappointing, as thirteen per cent of the infants between 2000 and 2500 grams and forty per cent of those between 1500 and 2000 grams failed to survive the first month. See Table VII.

PREMATURE MORTALITY, NEW YORK CITY, 286 CESAREAN SECTIONS

WT. IN GM.	NUMBER	DEATHS	MORTALITY %	MORTALITY FOR ALL PREMATURES %
Under 1,000	13	11	87	93
1,000-1,500	25	19	83	64
1,500-2,000	65	26	40	24
2,000-2,500	183	24	13	6
Total	286	80	28	18

In a similar study by Miller, it should be particularly noted that among two hundred fifteen premature infants born alive, there were twenty-eight deaths. These twenty-eight deaths accounted for just one-half of

fifty-five neonatal deaths among a group of more than three thousand deliveries. In other words, the premature infants born alive, while accounting for only 6.7 per cent of all live births, accounted for 50 per cent of the deaths occurring in this group. Of the two hundred fifteen prematures born alive, forty-four were delivered by cesarean section. Of these twelve died with a mortality rate of 27.7 per cent, which is statistically significantly higher than in spontaneous deliveries (10 per cent) or in all forcep deliveries (3.5 per cent). See Chart III.

CHART III

PREMATURE INFANT MORTALITY ACCORDING TO THE METHOD OF DELIVERY

Type of Delivery	Live born Premature Infants	Premature Infant Deaths	Per Cent
Spontaneous	119	12	10.0
All Forceps	28	1	3.5
Breech Extraction & Version Extraction	24	3	12.5
Cesarean section	44	12	27.7
Total	215	28	12.8

Lund, in a series of 159 cases of cesarean section during the ten year period from 1930 to 1940, was well aware of the role maturity played in the survival of the infant. The mortality rate was directly proportional to the age of the fetus in utero. In those delivered at seven months by cesarean section, the mortality rate was 100 per cent, while in the same age group for all other deliveries combined the mortality rate was 66 per cent. In the group delivered by section at ten months, the mortality rate was 3.9 per cent, while for those delivered by all other methods the

rate was 2.8 per cent. These figures are so striking, it scarcely need be pointed out that the gravity of the situation lies many times over in the choice of cesarean section as the method of delivery for the premature as against its being chosen for the full-term infant.

DISCUSSION

One would hope that an operation which, generally speaking, carries a maternal mortality of almost six per cent might offer as a reward almost a one hundred per cent promise of obtaining a living baby. A review of the literature shows that of 3,037 viable infants delivered by cesarean section, 257 died, a fetal mortality rate of 8.5 per cent. Fetal death

rate at the Boston Lying-In Hospital in cesarean section was 8.8 per cent, while the total fetal mortality in all types of deliveries, both stillbirths and neonatal deaths, was only 4.1 per cent. Surely one must stop and wonder if there is something wrong with a method of delivery which is accompanied by a risk of one chance in eleven or twelve of losing the baby, and in this particular instance where the general fetal death rate was doubled. If the operation is done primarily to save the baby, it seems on occasions to be most unsuccessful. An improvement is possible as regards infant mortality if elective cesarean sections can be postponed until after the thirty-sixth week of pregnancy. Since the test of labor has been a factor in about 25 per cent of fetal deaths, it is evident that better results may be obtained if trial labors are restricted to from eight to ten hours. Too often in the past they have been endurance contests, in which the mother, the baby, and the obstetrician all took part. "Watchful expectancy is essential, but not criminal procrastination."

Although the factor of trauma is a very important one in the production of asphyxia neonatorum, it should not be forgotten that by eliminating such a hazard through the employment of cesarean section, another dangerous threat to the infant is the factor of anesthesia and sedation. There is no drug at present, be it analgesic or anesthetic, that does not produce some

degree of respiratory depression to both mother and child. Prevention of fetal asphyxia demands methods of operating room analgesia and anesthesia that do not produce fetal anoxemia or injure the fetal respiratory center. Prevention of intra-uterine asphyxia or minimizing of its effects when unavoidably present should result in a real reduction in fetal and neonatal morbidity and mortality.

Clinical experience and statistics elicit the fact that the type of labor and its conduction by the obstetrician are factors of no little consequence in preventing birth injuries. The type of delivery not only affects the fetal death rate, but may contribute to the injury of the baby. Cesarean section for premature delivery should be avoided unless it is done on behalf of the mother. Statistics show that the fetal death rate and rate of birth injuries which occur to premature babies born by cesarean section are very high and are factors to be considered when delivering a premature baby. The question may now be raised as to why so many more premature infants were born by cesarean section than by other methods. This is due to the fact that many women with complications of pregnancy are delivered by this method. When consideration is given to the fact that many of the cesarean sections were done for the worst cases of placenta praevia and premature separation of the placenta as well as in cardiac patients who had congestive failure, although not a true indication for cesarean section but frequently used as one, it may be stated that this method of delivery often was selected because of some grave maternal complication and that the fetal mortality frequently was due to the effect of that maternal complication rather than to operation itself. Accordingly those who are of such belief might take refuge behind this seemingly good

explanation for their poor results with cesarean section. On the other hand, might it not be well for them to review their own experiences with a view to finding some constructive criticism which might better these results?

Schumann, of Philadelphia, states that in the prevention of eclampsia, "It is better to deliver threatening eclamptic one week before the first convulsion than twenty-four hours later." I agree. He further states that"If medical measures fail to stop the oncoming hurricane, do not wait until the storm hits, get the baby out early. You will always save the mother and will give the baby just as good a chance. There is no method of delivery as safe for the baby as a cesarean section with a proper anesthetic". How does he account for the fact that the operation carriex with it a fetal death rate of more than eight per cent and what does he mean by a proper anesthetic? I wonder if Dr. Schumann has taken the time to browse through some of the literature on the subject?

By no means should one expect cesarean section to guarantee the life of a monstrosity or an infant with congenital anomalies incompatible with life, such as hemorrhagic disease of the newborn, icteris gravis, erythroblastosis and hydrocephalus.

SUMMARY AND CONCLUSIONS

1. The total fetal mortality of infants born after cesarean section is higher than that of infants born spontaneously or by low forceps deliveries, by virtue of the fact that the incidence of premature infant births is significantly higher in the former than in the two latter groups. The higher incidence of premature infants born by cesarean section is partially due to the significantly higher incidence of mothers with certain complications of pregnancy delivered by this method.

2. Because of the peculiar sensitivity of the fetal respiratory system to depression by anesthetics, the factor of anesthesia must be regarded as an important one in the pathogenesis of respiratory failure at birth.

3. The effect of a drug on the mother is no indication of its effect on the newborn.

4. Cesarean section should be done only after consultation and roentgenologic examination indicate that the child shows no gross abnormalities and is over 1500 grams, unless the life of the mother might be jeopardized by postponing interruption of pregnancy.

5. Even if the fetus weighs 1500 grams or more, it is well to postpone cesarean section if the condition of the mother and child permit further delay.

6. No sedation should be given to the mother prior to the operation.

7. Wherever possible spinal anesthesia should be used with cyclopropane oxygen mixture as second choice.

8. Several hours before operation, vitamin K should be given to the mother as an aid to prevent hemorrhage in the child.

Cesarean section carries an inescapable fetal mortality even in selected cases, and when employed as an emergency procedure the risk is greatly increased. Fetal and neonatal death rates are appalling, when it is considered that the operation is frequently chosen with the belief that it will conserve child life. Better results may be expected only when the indications and contraindications for the operation are recognized, and it is understood that cesarean section is not a safe emergency procedure.

While a statistical analysis of infant morbidity and mortality may show the comparative safety of the various methods of delivery for the infant, it must be realized that the results of such a study can have no part in directing the choice of the method of delivery in the individual case. The obstetrical management of labor must depend on many factors, of which the safety of the infant is only one. The expectation of a lower infant mortality on cesarean section cannot be used as an argument for substituting this method for breech extraction and version and extraction, unless it can be clearly demonstrated that maternal morbidity and mortality are not thereby increased. The fact that cesarean section may result in infant mortality comparable to those found in normal spontaneous deliveries or low forceps deliveries does not in itself justify an increase in the incidence of the operation.

Because of the variability of conditions that arise as a result of the differences in opinion and technique among present day anesthetists

and obstetricians, as well as other operators, it is difficult for any one individual to evaluate adequately any statistics that he may collect. Until the time comes when more uniform conditions under which the operation is done can be established, conclusions concerning the infant mortality rate in cesarean section must rest on the observations made in individual clinics.

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