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Statistical survey of cesarean section at Nebraska University Hospital : with special reference to infant mortality : 1943-1953

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A STATISTICAL SURVEY OF CESAREAN SECTION AT
NEBRASKA UNIVERSITY HOSPITAL WITH SPECIAL
REFERENCE TO INFANT MORTALITY:
1943 to 1953.

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I. INCIDENCE:

In the ten year period, 1943 through 1952, cesarean sections done at the University of Nebraska hospital numbered 177. During this period there were a total of 4689 deliveries of all types at this institution, representing an incidence of 3.78 percent cesarean sections over this ten year period. Table I indicates by years, the number of deliveries and the number and percentage of cesarean sections.

Table I

Year	Births	Sections	Percent
1943	322	14	4.35
1944	283	10	3.53
1945	283	4	1.41
1946	378	5	1.32
1947	453	15	3.31
1948	515	19	3.69
1949	583	24	4.12
1950	670	27	4.03
1951	612	26	4.25
1952	590	33	5.60
Total	4689	177	3.78

These figures though somewhat lower than some reports compare favorably with most reports in the literature (1,2,3,4). Irving (1) in a review of cesarean sections of five large institutions found the incidence to vary from 2.5 to 6.1 percent. Andrews (5) in his series found the incidence to be 10.5 percent, while Levine (6) in 1939, reported an incidence in 13,600 deliveries of

0.9 percent sections. The improved operative techniques, skill of anesthesiology, rapid blood replacement, and availability of control of sepsis by antibiotic therapy has increased the incidence and lowered the hazard of the operative intervention in difficult obstetrical situations over the years. Levine states that the major causes of the increase of cesarean sections are the earlier operation in suspected disproportions, repeat sections, termination of pre-eclampsia and toxemia, and more frequent use in antepartum hemorrhage. Andrews in his series found the number of deliveries in 1946 to be two and one-half times the 1935 figure while the number of cesarean sections was six times greater than the 1935 section rate.

Table I illustrates the increase in percentage of cesarean sections at the University hospital during the past ten years paralleled by an increased number of total deliveries. The increased incidence of cesarean sections is due primarily in this analysis to the larger number of sections being done with the indication of previous cesareans (Table II). As can be seen by the table on the following page, repeat sections have grown in number out of proportion with the other three primary indications for section.

Table II

Indication	43	44	45	6	47	48	49	50	51	52
Previous Section	1	1	0	1	2	5	6	10	10	12
Cephalo-pelvic Disproportion	6	2	2	3	4	6	7	5	2	4
Placenta praevia Abruptio placenta	0	3	1	0	3	3	1	5	3	6
Pre-eclampsia & Eclampsia	0	2	0	1	0	0	2	4	4	4

D'Esopo (7) and Irving have found an incidence approximately twice as large among private patients as among public patients. D'Esopo states that with ward patients the staff is more likely to follow the standard procedures in management of the situation at hand while on the private service factors which reflect on the desirability of obtaining a living child are focused in the attention of the physician. This individualization results in a greater latitude in the limits of acceptable indications and more cesarean section are done in the interest of the child. This discrepancy is not found in comparing the section incidence of this series with a comparable series of another large private institution in this city, both covering the same period of years (8).

II. INDICATIONS:

The rising incidence of cesarean section has been brought about by the widening scope of indications and more frequent use of section under the more or less standard indications of the past. The greater safety with which the operation can be performed at present, both in regard to mother and infant, has, for the most part brought this form of obstetrical management more and more into acceptance in many critical conditions.

Table III shows the indications for cesarean section at the University hospital during the ten year period. Among this group twelve had two indications (e.g. placenta praevia and previous section or toxemia and cephalo-pelvic disproportion) either of which would have been an indication for section. These, however, are listed under one indication, thus the number of indications of individual cases equals the actual total number of sections done.

While now the dictum of "once a section always a section" is generally accepted, only part of the rise of cesarean incidence is due to repeat sections. Greenhill (9) and others ascribe to this concept except in the occasional case in which a patient who has had a previous low cervical section falls into labor and there is early cervical dilatation and descent of the head (10,11).

Table III

Indication for Cesarean Section

Previous section	48
Previous section for:	
Cephalopelvic disproportion ..	23
Toxemia	1
Unknown	24
Cephalo-pelvic disproportion	34
Placenta praevia	21
Pre-eclampsia and eclampsia	14
Transverse lie and other abnormal .	9
presentations	
Abruptio placenta	6
Inertia and dystocia	4
Fetal distress	3
Diabetes	3
Multiple leiomyomata	2
Cardiac	2
Rupture of the uterus	1
Carcinoma of the cervix	1
Post - mortum (toxemia)	1
Prolapse of cord	1
Sociological (sterilization)	1
Lupus erythematosus	1
Polyhydramnios	1
Ventral hernia	1
Previous stillborns (1v).....	1
Schizophrenia	1
Epilepsy	1
Miscellaneous	8
Unknown	12
 Total	 177

The danger of rupture of an old uterine scar, even if the previous section has been a laparotrachelotomy, outweighs the risk involved in section of the patient. Rupture of an old scar is said to occur in three percent according to Studdiford (12) while Eastman gives the lower figure of one and one-tenth percent (4).

At the University hospital the indication of previous section has been the leading indication for cesarean section in the past ten years, being the indication in 48 cases (27.1%). The indication for the previous section is shown in Table III. However as has been seen in Table I there has been a progressive increase in the number of repeat sections during the ten year period. The percent of repeat sections in this group is somewhat lower than that reported by other authors (1,3,12, 13) who have also found this to be the most common indication for operation.

Cephalo-pelvic disproportion was found to be the second most common indication for cesarean section of the 177 cases studied, 19.2% of the section being done for this reason. Reports in the literature describing similar but larger series have a greater percentage figure than the percent incidence found here (3,12,13). Levine in a review of 697 cesarean sections over a twenty year period (1938-1947) found cephalo-pelvic disproportion to be the most frequent indication. Cases of cephalo-pelvic disproportion should be carefully evaluated by pelvic measurement and x-ray pelvimetry and a test of labor tried if the birth canal is thought to be at all adequate. However decision as to the type of delivery should be reached within 12 to 24 hours (9,11). In the cases of

cephalo-pelvic disproportion here presented 13 did not have a trial of labor.

11.9% of sections were for placenta praevia, this figure again being lower than the above mentioned reports. While the group studied here showed little increase in the past ten years, reports in the literature indicate section is now more frequently resorted to in the management of this condition than was the practice in the past (9).

Pre-eclampsia and eclampsia uncontrolled by medical management was fourth in greatest numbers of sections performed. Eclampsia, generally is a contraindication to section except on rare occasion in the opinion of most. Half of the 14 patients under this combined classification as shown in Table III were sectioned on this indication.

Dystocia and uterine inertia, formerly the foremost cause for section, in this review accounted for only 4 sections (9).

Other less frequent indications for section were fetal distress with no apparent reason, accounting for 3 sections; diabetes for 3; multiple myomata, 2; cardiac indications, now less frequently indicative than in the past, accounting for 2. Carcinoma of the cervix, a post-mortum section, the mother dying of toxemia,

prolapse of the cord, lupus erythematosus, polyhydramnios, ventral hernia, schizophrenia, and epilepsy were indications in one case each. There were 12 cases in which no indication could be determined because either the charts were not available or inadequate in history.

III. TYPE OF SECTION:

As can be seen in Table IV low cervical cesarean section or laparotrachelotomy was the most frequently employed technique of operation at the University hospital during the ten year period reviewed, the numbers of this type procedure increasing steadily during the interval. Reports in the literature generally bear out this trend toward low cervical section (3,14).

Table IV

Types of Cesarean Section*

Year	43	44	45	46	47	48	49	50	51	52
Low Cervical	5	5	1	5	7	6	14	19	21	28
Classical	6	4	1	0	6	10	6	5	2	2
Cesarean Hysterectomy	0	0	1	0	1	0	0	2	2	2
Unknown	2	1	1	0	1	3	3	1	1	1

* Cases of rupture of the uterus in 1943 and 1949 in which delivery was thru site of rupture which was extended.

There were 111 low cervical sections done during this period representing 62.7 percent of all sections. 42 or 23.7 percent of the sections performed were classical, 8 sections (4.5%) cesarean hysterectomies, and in 12 cases (7.9%) the procedure used is unknown.

This operation (laparotrachelotomy) in which uterine incision is made in the lower uterine segment following reflection of the bladder, has gained great popularity in recent years due to the safety from uterine rupture in subsequent pregnancies and fewer post-operative complications. While it is not possible to determine the strength of a uterine scar it is felt that a scar of the low uterine segment is less likely to rupture than is one of the corpus (9). Among the 177 sections reported here only two cases of rupture of the uterus occurred, both cases having had a section previously. Diddle et al (15) reports finding various grades of rupture in 1 in 18 among several hundred repeat sections. The post-operative complications in this type of section are also greatly reduced due to a lesser amount of spillage of amniotic fluid into the peritoneal cavity and as the incised portion of the uterus is covered by the bladder, a lesser amount of seepage (9,10).

Classical section as mentioned has fallen into ill repute due to the higher incidence of rupture and post-

operative complications (9,10,14). Falls (16) feels that the incidence of rupture and post-operative complications are no higher in classical sections than cervical sections except where the patient is infected or potentially so. This author found no difference in difficulty of operation between the two types.

Extraperitoneal section was not done in this series. This procedure which formerly was utilized in cases of infection has fallen into disuse since the advent of antibiotics and most authors feel it is no longer needed (9,10). However Gilbert et al (14) feel the operation should be utilized if the patient is infected or has been in labor 30 hours or more even with antibiotics.

Cesarean hysterectomy, used in cases in which there are fibromyomata, infection, or other disease of the uterus, was used in 8 cases at the University hospital. This operation, incorrectly called the Porro section, should not increase the maternal mortality of section in comparison with the other types if correctly done (9,10).

IV. ANESTHESIA:

Recent developments in the field of anesthesiology have decreased the risk to a patient undergoing cesarean section in a large degree. At the University hospital

all sections are done under the care of a skilled anesthesiologist who can afford this aspect of the operation the careful attention necessary.

At the University hospital anesthesia for the 177 sections in the past ten years was as follows: spinal, 79 or 44.6%; general, 40 or 22.6%; local and general, 21 or 11.9%; spinal and general, 13; local, 8; continuous caudal, 3; unknown, 2. These figures bear out those found generally in the literature, spinal anesthesia being most commonly used (5,6,12,17,18,19).

Spinal anesthesia offers much to both mother and child not possessed by other forms of anesthesia. Advantages of this type of anesthesia are decreased blood loss, good relaxation, less nausea and vomiting, smoother convalescence, less fetal depression, spontaneous crying of the baby (18,19,20). As the autonomic nervous system of a pregnant woman is extremely labile the disadvantages of vasomotor instability, bringing about decreased blood return to the heart, decreased cardiac output with resultant anoxia to mother and child which must be carefully guarded against. Because of this vasomotor instability spinal anesthesia is contraindicated in hemorrhage, anemia, heart failure and other cardiac disease, and shock or hypotension (18,20). In the 27 cases of placenta praevia and abruptio placenta in this

group studied only 4 were given spinal anesthesia.

Lull (19), Flowers (20) and Anchos (21) feel continuous spinal anesthesia to be the method of choice in most sections. However this technique requires special equipment and skill. This type of anesthesia was not employed in this series.

General anesthesia is indicated in hemorrhage, severe anemia, cardiacs as well as other situations. The disadvantages of this type of anesthesia are fetal depression, and nausea and vomiting (18,20). An anesthetist should be available for intubation if needed if this type of anesthesia is to be utilized in most cases.

Continuous caudal anesthesia has fallen into disuse in the past few years due to difficulty of administration and number of side effects. Flowers states chronic hypertensive disease and cardiacs are handled well by this method.

Local, usually in combination with pentothal or a general anesthesia offers advantages to selected patients but is much less frequently used than in previous years.

V. MATERNAL MORTALITY:

Among the 177 cesarean sections four maternal deaths occurred. These four deaths were the result of: one case of abruptio placenta with hemorrhage; one case

of toxemia with post-mortum section; one case each of lupus erythematosis and carcinoma of the cervix, the patients expiring some time after section. With the possible exception of the patient with abruptio, who expired during operation, none of these deaths can in any way be attributed to the operative procedure as the cause of death. Deaths due to section must result from shock, anesthesia, hemorrhage or puerperal infection from the site of operation to be counted in maternal mortality of section (16). The maternal mortality in this report is then 0.57 percent.

Cesarean section is said to hold for the mother a hazard fifteen times as great as does the normal type of delivery from below (1). The 1949 maternal mortality estimated by the National Office of Vital Statistics was 8.2 per 10,000 live births. This is a gross mortality including cesarean section. Fitzgerald et al (23) gives a gross maternal mortality of 7.9 per 10,000 live births in 1951. Hull and Ullery (19) report in 1000 cesarean sections in their series maternal mortality has decreased 72 percent in comparison with previous figures. Mortality decreased from various causes as follows: 91 percent from infection; 77 percent from

hemorrhage; 73 percent from toxemia; and 23 percent from heart disease.

Diekmann, as reported by Gordon (24) gives a maternal mortality in 4,497 cesarean sections of 0.24 percent. Other figures range from this figure to 5.9 percent (1,3,9,12,16,24). Diekmann (24) feels the mortality from this operation should not exceed 0.1 percent or 1 per 1000. Gordon (26) found the maternal mortality among colored people to be three times that found in whites.

The primary cause of maternal mortality is argued by various authors, some stating hemorrhage to be the leading cause while others state infections hold the major causative role (23,24,25,26). Hingson and Hellman (27) found aspiration of vomitus to be the leading cause of maternal death in their series and overdosage of spinal anesthesia second. Gordon (24) ranks infection first, anesthesia second and hemorrhage third as causes while Lull and Kimbrough (25) rank infection first, hemorrhage second, toxemia third and anesthesia sixth.

VI. INFANT MORTALITY:

A. Fetal and Neonatal Mortality.

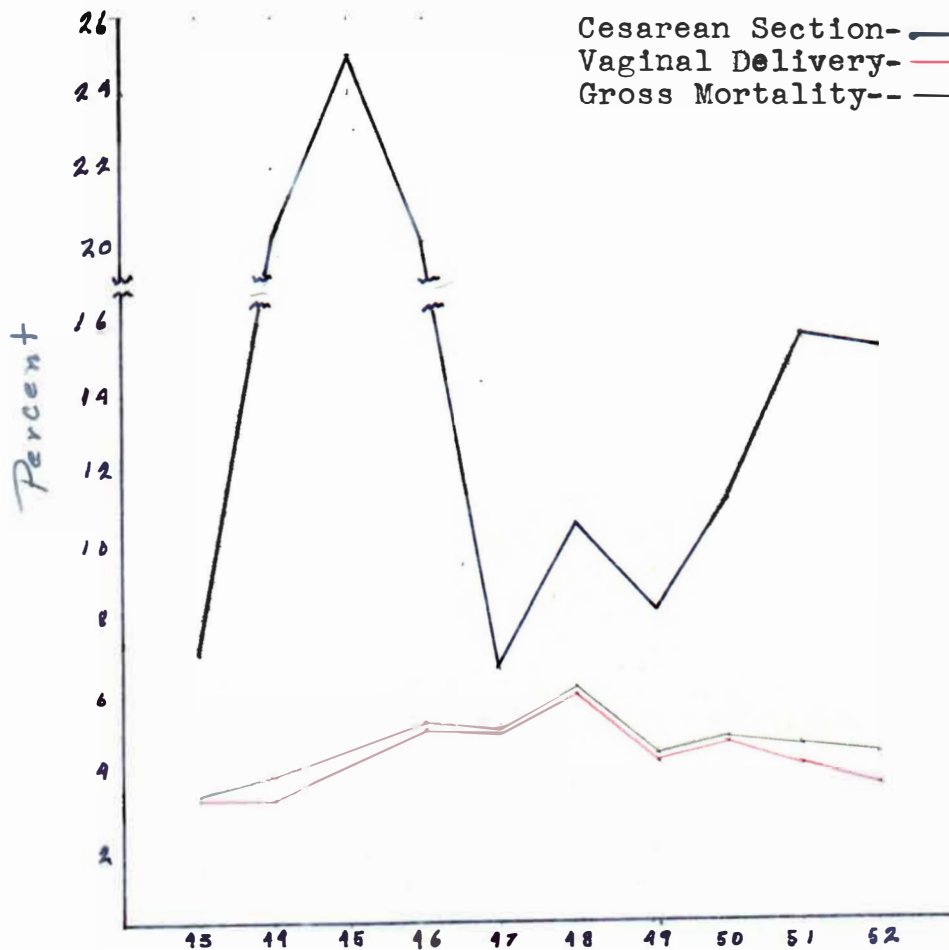
With the increased skills and techniques of obstetric

practice fetal and neonatal mortality has been greatly reduced in the past few years, partly due to care of the infant by a pediatrician immediately following delivery and partly due to better obstetrics. In 1915 there were 99.9 infant deaths per 1000 live deliveries while in 1948 this had been reduced to 32 per 1000 (28). Much of this reduction in infant deaths is in those infants delivered via the vaginal route and to a lesser extent to reduction in cesarean section deaths.

During the ten year period under study there were 219 fetal and neonatal deaths from all types of deliveries at the University hospital, representing a gross, uncorrected infant mortality for the 4,689 deliveries of 4.46 percent. The corrected figure of gross infant mortality, i.e. stillbirths excluded was 2.3 percent. This compares favorably with reports in the literature of infant mortality (2,4,9,12,13,20,29). The contemporary figures for cesarean section delivery were 177 sections with 23 infant deaths or a gross infant mortality of 13.6 percent. The corrected mortality was 8.5 percent. Although the above figures of fetal and neonatal mortality are above many percentages reported in the literature they fall well within the range of figures reported in the various series (1,2, 5,6,9,12,13,15,17, 30,31,32,33,34).

Figure I illustrates graphically the uncorrected cesarean section, vaginal delivery and gross infant mortality.

Figure I



One might anticipate a gross fetal and neonatal mortality in cesarean section higher than that of vaginal delivery simply on the basis of the indications for cesarean sections e.g. fetal distress, dystocia and prolonged labor, placenta praevia, abruptio placenta,

and rupture of the uterus. However Diddle and others report a corrected fetal mortality of section approximating that of the gross figure (9,13,15).

B. Length of Life.

As an infant survives for a period of time his chance of survival increases proportionately. Most fetal and neonatal deaths occur in the first month of life, two-thirds of those occurring in the first year (28). Of these a very large number occur in the first 24 hours following birth, up to 30 to 50 percent of deaths occurring during this interval (25,28,35). Hawkins (35) states approximately 30 percent of neonatal deaths occur in the first 4 hours. The life expectancy of the premature increases considerably if the infant survives the first 24 hours.

Among the neonatal deaths in this series here reported only two lived beyond the 24 hour period. Three died within the first four hours and the longest length of survival was but 40 hours.

C. Stillbirth.

Stillbirths account for a large percentage of fetal deaths from both the vaginal and cesarean route of delivery. Among the total 219 infant deaths of all types of deliveries there were over 100 stillbirths or

approximately 50 percent of all the deaths. This has been found by many authors to be the approximate rate of stillbirth, various reports ranging from 30 to 50 percent (4,28,29).

Among the cesarean section deaths 8 or one-third of the total mortality were stillbirths. As with the total figures of all types of deliveries reports in the literature indicate that approximately 30 to 50 percent of section mortalities are due to stillbirth (6,12,13,30).

Of the eight stillbirths in this series all suffered intrauterine anoxia as the cause of death. Four of these deliveries were indicated by abruptio placenta or placenta praevia. Other indications for section in the other four stillbirths were one case each of rheumatic fever, eclampsia with post-mortum section, cephalo-pelvic disproportion, and previous section, the latter two having had a trial of labor. Five of these eight stillborns were premature, three of those delivered for placenta praevia and abruptio, that of rheumatic fever and the one case of post-mortum section.

Stillbirth would most certainly be higher in the group delivered by the vaginal route if it were not for the fact that many of these cases, which would without doubt predominately result in stillbirth, are

sectioned. It is surprising that the rate of stillbirth in cesarean section is not far above other types of delivery when one considers the grave indications for section, abruptio, placenta praevia, rupture of the uterus, etc. Landesman (34) feels that even section will not appreciably improve fetal salvage in abruptio placenta.

D. Causes of Fetal and Neonatal Mortality.

Table V shows the 23 fetal and neonatal deaths which occurred during the interval of this study. As has been stated 8 or approximately 30 percent of these deaths were stillbirths. The table shows the indication for section, length of survival of the infant, weight, cause of death and whether autopsy was performed. All slides of these autopsies were re-examined for possible clarification of existing pathology causing death and with the specific idea of studying the lung tissue again in search of hyaline membrane disease. See the following two pages.

Primary cause of death determined by the re-evaluation of autopsy material and case histories for the 23 fetal and neonatal deaths are as follows: intrauterine anoxia, 8; prematurity, 6; hyaline membrane, 6; intracranial hemorrhage, 2; congenital anomalies, 1.

INDICATION	AGE	WEIGHT	SEX	ANESTHESIA	AUTOPSY	CAUSE OF DEATH*
1. Ruptured Uterus	4 h	?	F	Spinal	Yes	<u>Prematurity & Immaturity</u>
2. Placenta Praevia	24 h	2# 8 $\frac{1}{2}$ "	F	Local	Yes	<u>Intracranial hemorrhage</u> <u>Erythroblastosis</u>
3. Unknown	5 h	4# 12"	F	Local	Yes	<u>Prematurity</u> <u>Asp. of Amniotic Fluid</u>
4. Contracted Pelvis	S.B.	7# 2 $\frac{1}{2}$ "	F	General	Yes	<u>Intrauterine Anoxia</u>
5. Eclampsia	9 h	4# 8"	F	Spinal	Yes	<u>Hyaline Membrane 3/4</u> <u>Asp. of Amniotic Fluid</u>
6. CA of Cervix Grd. III	8 h	3# 13 $\frac{1}{2}$ "	F	General	Yes	<u>Hyaline Membrane 3/4</u> <u>Prematurity</u> <u>Atelectasis and Aspiration</u>
7. Previous Section	1 d	3# 13"	M	Spinal	Yes	<u>Hyaline Membrane 1/4</u> <u>Prematurity and Immaturity</u> <u>Atelectasis</u>
8. Placenta Praevia	5 min	?	F	Local Pentothal	Yes	<u>Prematurity</u> <u>Asp. of Amniotic Fluid</u> <u>Hyaline Membrane 1/4</u>
9. Rheumatic Fever	S.B.	1# 2 $\frac{1}{2}$ "	F	General	No	<u>Intrauterine Anoxia</u> <u>Immaturity</u>
10. Previous Section	S.B.	7# 5"	F	Spinal	No	<u>Intrauterine Anoxia</u>
11. Pre-eclampsia	1 d	4# 2 $\frac{1}{2}$ "	M	Local General	Yes	<u>Prematurity</u> <u>Hyaline Membrane 1/4</u>
12. Abruptio Placenta	S.B.	7# 4"	F	General	Yes	<u>Intrauterine Anoxia</u>

Table V

INDICATION	AGE	WEIGHT	SEX	ANESTHESIA	AUTOPSY	CAUSE OF DEATH*
13. Placenta Praevia	12 h	3# 0"	M	General	Yes	<u>Prematurity</u> <u>Atelectasis</u> <u>Hyaline Membrane 1</u>
14. Abruptio Placenta Toxemia	26 h	4# 3"	M	Local General	Yes	<u>Intraventricular Hemorrhage</u> <u>Hyaline Membrane 3</u>
15. Lupus Erythem- atosis	2½ h	3# 15"	F	Spinal	Yes	<u>Prematurity</u>
16. Pre-eclampsia	2 h	4# 10½"	M	Spinal	Yes	<u>Hyaline Membrane 4</u> <u>Prematurity</u>
17. Placenta Praevia	18 h	4# 4"	M	General	Yes	<u>Hyaline Membrane 4</u> <u>Prematurity and Immaturity</u> <u>Asp. of Amniotic Fluid</u>
18. Toxemia	40 h	7# 0"	M	Spinal	Yes	<u>Hyaline Membrane 4</u> <u>Pneumonia</u> <u>Atelectasis</u>
19. Placenta Praevia	S.B.	4# 5"	M	General	Yes	<u>Intrauterine Anoxia</u>
20. Abruptio Placenta	S.B.	3# 1"	F	General	Yes	<u>Intrauterine Anoxia</u>
21. Fetal Distress	9 h	5# 3½"	F	Spinal	Yes	<u>Congenital Anomalies</u> <u>Hyaline Membrane 1</u>
22. Toxemia, Post- Mortum	S.B.	2# 12"	M	None	Yes	<u>Intrauterine Anoxia</u>
23. Abruptio Placenta	S.B.	4# 0"	F	General	No	<u>Intrauterine Anoxia</u>

* Cause underlined principle cause of death.

All of the 18 infants whose sections were studied showed evidence of varying degrees of aspirated amniotic fluid and cellurlar debris in the alveolar spaces of the lungs. This is indicative of intrauterine anoxia of some degree (28). Some difficulty in determination of the factors contributing to death in these cases was found so that in cases in which more than one entity contributed to the infants death all these factors are listed in Table V.

Factors causing fetal and neonatal deaths are both intrinsic such as prematurity and congenital anomalies and extrinsic such as anesthetic depression, birth trauma, hard labor and intrauterine anoxia or a combination of these two factors.

Prematurity is generally held to be the leading cause of neonatal death (2,15,29,30,35,36). However in many cases this diagnosis is reached when other causes which are unrecognized under present methods and knowledge are the actual cause of death (36). Other authors report other causes as the primary cause of fetal and neonatal deaths in their series; intrauterine anoxia (28), and hyaline membrane (36,37). Other leading causes of fetal and neonatal deaths are pulmonary lesions, intracranial hemorrhage, congenital anomalies, and erythroblastosis (15,28,29,35,36,37).

The leading causes of neonatal deaths listed in the Vital Statistics of 1949, the last year for which figures are available, are prematurity, post-natal asphyxia and atelectasis, birth injuries, intracranial injuries being most common, pneumonia and erythroblastosis. These are exclusive of fetal deaths and include deaths occurring from all types of deliveries. Figures for deaths occurring among section babies are not available in this report.

(1) Intrauterine anoxia was the cause of death among the eight stillbirths. Five of these infants were autopsied with similar findings in each case. All showed congestion of all organs, fetal atelectasis of the lungs of varying degrees, and aspirated amniotic fluid and debris in the alveoli also of varying degree. In two of these infants a formation in the alveoli having the appearance of and staining similarly to the hyaline membranes seen in the other infants liveborn was seen. This was scattered and appeared as does the early membranes described. No other pathological condition was present which might have caused death. Five of the infants fell with in the premature weight range.

(2) Prematurity as mentioned above is held to be the major cause of neonatal mortality. Arey states prematurity is never a cause of intrauterine death.

19 of the 23 infants of this series were premature, five of these being stillborn. This is a rather high rate of prematurity but as can be seen from the indications listed in Table V prematurity was unavoidable in all but the one case of repeat section. An error of calculation of the length of pregnancy probably accounts for this premature delivery. The cesarean section premature birth rate in the literature ranges from 6 to 30 percent (15) and was found in this group to be 28.5 percent. The infirmity of the premature accounts for the greater number dying as compared with mature infants, death among prematures occurring in 40 to 70 percent of births while only approximately 5 percent of term infants die (4,15).

Of the 14 live born prematures in only six can the diagnosis of prematurity as the major cause of death be given. In the others a more probable cause of death was found to which prematurity of course added to the obstacles in survival. Prematures are not suited anatomically or physiologically for easy survival, their organs, lungs, kidneys, gastrointestinal mucosa and temperature regulating mechanism not being sufficiently well developed to carry on normal function (29). Therefore any superimposed

impediment weighs heavily on the infants ability to survive. Also due to the poorer developmental level of the premature infant it is more susceptible to birth trauma and disease following birth. Calkins (39) states that the incidence of premature fetal mortality is increased if the mother has had a major complication of pregnancy, a view held by most but debated by some. The rate of premature births and hence the fetal and neonatal mortality can be reduced by better prenatal care.

(3) Post-natal asphyxia and atelectasis is the second leading cause of death among neonatal deaths according to national vital statistics (38). Anoxia was found to be the leading cause of death in the series of several authors (28,36,37). Lung lesions of varying types which might account for this anoxia or asphyxia were found to be the primary cause of death by others (29). Prematures are especially susceptible to these pulmonary complications (29,40,41,42).

Cesarean section babies seem to be especially prone to respiratory complications, particularly prematures (31,32,43). Bloxsom as reported by Litchfield (31) feels that this proneness is due to failure of conditioning of the baby by uterine contractions and

passage through the birth canal. Landau (43) and Bloxson feel a test of labor decreases the incidence of post-section asphyxia by 25 percent.

One of the most common causes of post-natal asphyxia which has come into general recognition during the past ten or so years is the entity known as hyaline membrane disease. This condition presents a clinical picture in which the infant breathes normally and spontaneously for a variable period of time, soon has attacks of dyspnea and cyanosis which are recurrent at intervals, progressively more severe and which ultimately in many cases terminates fatally for the infant (43,44).

This entity is found only in those infants who breathe according to most but a similar picture histologically has been seen in stillborns according to Blystad (45) and Miller (40) (41,45,46). The picture of an early hyaline membrane was seen in two of the stillborns whose autopsy slides were reviewed. Prematures show this condition more frequently than do mature infants, the reason being obscure, and is found only in prematures according to Dunham (41) (28,37,40, 42,44).

The etiology of the hyaline membrane has not been determined, many theories as to possible explanation

having been advanced, none of which have been proven (42). Breathing is necessary for formation and many feel the membrane is composed of aspirated contents of the amniotic sac and vernix (28). The picture of hyaline membrane is to be found in adults afflicted with many differing diseases (42).

Among the 25 neonatal deaths occurring in this group 6 were due to hyaline membrane formation. All these showed evidence of anoxia as shown by amniotic fluid and debris in the alveolar spaces. 5 other infants also evidenced hyaline membranes of lesser degree, these infants having other entities as the primary cause of death. Only one of these six infants whose cause of death is ascribed to hyaline membrane had been classed as having a hyaline membrane at the time of the original study of the slides. It is probable that more infants dying during the neonatal period and particularly during the first 48 hours will be recognized as being afflicted with hyaline membrane disease. In the future now that the clinical and pathological picture is better understood. This disease has now gained a position of one of the greatest causes of neonatal death at this time.

(4) Birth injuries accounted for only two deaths in

this group, both from intracranial hemorrhage, which is the most frequent birth injury resulting in death. These two infants, both of whom were prematures lived 24 and 26 hours respectively. In both other factors contributing to their demise were found. One, an eighth pregnancy also showed signs of erythroblastosis and the other delivered because of abruptio placenta showed evidence of a moderate hyaline membrane formation in the lungs.

(5) Congenital anomalies accounted for one neonatal death in the group studied. This child delivered because of fetal distress lived 9 hours and was found to have cardiac anomalies incompatible with life. However there was also evidence in the lungs of a pneumonitis and aspirated amniotic fluid plus a slight hyaline membrane.

(6) Spinal anesthesia and particularly continuous spinal anesthesia, as has been stated before is the anesthetic method of choice for cesarean section both with respect to maternal safety and well being and safety of the infant.

General anesthetics produce a concentration in the fetus in direct proportion to the concentration in the maternal blood stream due to the rapid transference

across the placenta (18,20). Therefore it is to be expected to increase any anoxia or asphyxia which might be already present. This depression of the infant aggravating pre-existing anoxia may increase the amount of material aspirated by the infant (19,20). Spinal anesthesia on the other hand does not so affect the infant and so leads to lesser degrees of fetal depression and decreases the number of infants which require resuscitation due to the depression of the agent, all of which leads to greater fetal salvage (18,19,30,38).

General anesthesia was used in 6 of the 8 deliveries resulting in stillbirths. However the indication in 4 of these cases was placenta praevia or abruptio in which the anesthesia of choice is general. In cases of abruptio and placenta praevia the effect of general anesthesia is difficult to evaluate as to its importance in the depression and anoxia causing death. The one case in which general anesthesia may have been an important factor in the infants death was indicated by a contracted pelvis and the in was at term. In this case however the mother also had Lues and chronic hypertensive disease.

Several of the babies delivered under both general

and spinal anesthesia, but more particularly the former required immediate resuscitation. Spinal anesthesia it would then appear offers more to the safety of the child delivered by cesarean section.

VII. SUMMARY:

1. Cesarean section incidence at the University of Nebraska Hospital during the ten year period, 1943 to 1953 was 3.78 percent, a lower figure than many institutions report. On the whole the rate of incidence has been rising due primarily here to the increased number of repeat sections.
2. Increased incidence of sections brought about by wider acceptability of section in situations where it was not formerly used and more frequent use in more-or-less standard situations. Repeat section and cephalo-pelvic disproportion are the most frequent indications.
3. Low cervical section is the most popular type of section at present.
4. Spinal anesthesia is the safest anesthetic method for cesarean section. While it was not used in this series continuous or fractional spinal is preferred over single dose method by many. General anesthesia is indicated in severe hemorrhage, cardiacs, etc.

5. Maternal mortality due to section in this group was 0.59 percent. Figures ranging from 0.24 to 5.9 percent are reported in the literature.

6. Infant mortality in cesarean section has fallen over the years although the group here presented did not show this tendency. The fetal and neonatal mortality in this series was 13.6 percent or 8.5 percent corrected, a figure comparable with others reported. 8 of these 23 total deaths were stillbirths. The leading causes of death among the neonatal deaths were prematurity, hyaline membrane and intracranial hemorrhage.

VIII. CONCLUSION:

Cesarean section holds the answer to safe delivery in many critical obstetrical situations. For this reason the number of sections performed grows yearly with the greater number of indications being accepted today. Maternal mortality has been lowered considerably by better operative techniques, antibiotic therapy, rapid blood replacement and improved anesthetic methods and has, in a great measure, allowed the increase of sections. Much of the increase in cesarean sections seen today is due to the repeat sections as once a section is performed on a patient

she is, as a general rule committed to section in subsequent pregnancies.

While the incidence of section at the University hospital is somewhat lower than generally reported in the literature the fetal and neonatal mortality rate is higher than most reports would indicate. This is probably due to the type of patient seen in a public institution, those who are illiterate, not well informed or mentally deficient and who for these reasons and because of financial reasons have little and not infrequently late prenatal care. This of course would seem to raise the percentage of mortality above that encountered in private patients where, for the most part prenatal care has been excellent.

It is to be anticipated that cesarean section will lead to a greater fetal and neonatal mortality simply in view of the reasons for section as mode of delivery. One cannot expect a fetal salvage as great as by the vaginal route in the face of such dire circumstances as fetal distress, abruptio placenta, placenta praevia, rupture of the uterus, etc.

Stillbirths account for 30 to 50 percent of cesarean section infant deaths. This was found to be true in this group. Much can be done to prevent this loss of

life by better prenatal care and earlier diagnosis and delivery in situations which lead to stillbirth.

Prematurity and hyaline membrane disease were the chief causes of neonatal deaths in this group as well as in others. Prematurity may be lessened by control of factors leading to premature birth. Better care in prevention of premature labor, pre-eclampsia etc. and closer determination of the length of pregnancy in elective sections will do much to cut the premature rate and increase fetal salvage. Hyaline membrane disease will require a great deal of work in the future to discover the etiology and treatment of the disease. This disease takes many infant lives each year and its control would mean a great reduction in neonatal deaths.

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