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CAUSES OF FETAL AND NEONATAL DEATH*

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SUMMARY: Taşdelen E, Aksoy F, Arvas A, Berk Y, Ataoğlu N, Dervişoğlu S, İlter Ö. (Neonatology Unit, Department of Gynecology and Obstetrics, and Department of Pathology, İstanbul University Cerrahpaşa Faculty of Medicine, İstanbul, Turkey). Causes of fetal and neonatal death. Turk J Pediatr 1995; 37: 201-207.

Autopsy was performed on 601 out of 654 (91.9%) fetus and newborn cases of death which occurred during a four-year period between 1988-1991 at İstanbul University Cerrahpaşa Faculty of Medicine, Gynecology Department and Neonatal Unit. According to autopsy findings, among the main causes of death in newborns were infection, hyaline membrane disease, congenital anomalies, perinatal hypoxia and immaturity, and in the fetal period, perinatal hypoxia, asphyxia and congenital anomalies. In these cases, when pathologic and clinical findings were examined, it was observed that in 204 out of 301 newborn cases (67.8%) the clinical findings were well correlated with the autopsy findings; in 97 (32.2%) of the remaining cases the main disease and primary causes of death could not be determined through clinical findings; in 69 (23%) cases, in addition to the clinical diagnosis on autopsy, minor defects were determined on autopsy which were not directly related to death. When clinical and autopsy findings were compared, diagnoses with the highest discordance were pulmonary hemorrhage infection and intracranial hemorrhage. *Key words: neonatal death, intrauterine death, neonatal autopsy.*

In recent years the number of autopsies performed has significantly declined; however in many studies conducted by clinicians and other researchers, the importance of autopsy is emphasized because of its contribution to scientific research, understanding differences during various phases of diseases, determining specific case characteristics, and educating doctors and patients[1-10]. Studies on newborn autopsy findings are limited compared to adult cases[11].

However, the results of fetal and neonatal autopsies may provide significant information for subsequent pregnancy decisions and genetic counseling[1].

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We have retrospectively studied autopsy cases in a four-year period in order to determine the autopsy percentage of our unit, see the correlation between clinical and pathological findings, and emphasize the importance of fetal-neonatal autopsy.

Material and Methods

Clinical and pathological records of fetal and neonatal death cases in our unit during the four-year period between January 1988 and December 1991 were studied to determine the number of autopsies and rate of discordance between clinical and pathological findings. The pathological features of diseases in different phases and the personal differences in the same disease in various infants were also investigated.

Results

During the four-year period there were a total of 15,510 births in our unit. The number of deaths in this period was 654 (318 fetal deaths). Out of 654 cases, autopsy was performed on 601 (91.9%). The distributions of the number of births, deaths and autopsies are shown in Table I. Ninety-five percent of these (n = 550) were preterm and 8.5 percent (n = 51) were term babies.

Table I: Yearly Distributions of Birth, Death, Autopsy Cases and Autopsy Rates

Year	Number of Births	Number of Deaths	Number of Autopsies	Autopsy/Death Rate (%)
1988	3565	141	109	77.3
1989	4640	191	187	97.9
1990	3985	166	154	92.8
1991	3320	156	151	96.8

One hundred and fifty-eight of 301 (52.5%) neonatal deaths occurred in the first 24 hours of life. The causes of death occurring during the first 24 hours after birth were hyaline membrane disease in 66 cases (41.8%), hypoxia-asphyxia in 35 cases (22.1%), infection in 31 cases (19.6%), and congenital anomalies in 14 cases (8.8%). The number of deaths recorded after 72 hours was 54 (17.9%) (Table II). When the clinical findings of the 302 neonatal deaths were studied in the order of frequency of occurrence, 67 cases involved hyaline membrane disease (22.3%), 54 cases infection (17.9%), 51 cases congenital anomalies (16.9%), 44 cases hypoxia-asphyxia (14.6%), 29 cases severe immaturity (9.6%), 20 cases intracranial hemorrhage (6.7%), three cases hydrops fetalis (1%), and one case pulmonary hemorrhage (0.4%). Thirty-two cases were lost due to twin pregnancy complications (10.6%) (Table III).

Table II: Distribution of Cases According to Age at Death

Death Age (Hours)	Number of Cases	Percentage (%)
< 24	158	52.5
24-48	68	22.6
49-72	21	7.0
> 72	54	17.9

Table III: Clinical Diagnoses of 301 Neonatal Death Cases

Clinical Diagnosis	Number of Cases	Percentage (%)
Hyaline Membrane Disease	67	22.3
Infection	54	17.9
Congenital Anomalies	51	16.9
Perinatal hypoxia-asphyxia	44	14.6
Twin pregnancy complications	32	10.6
Immaturity	29	9.6
Intracranial hemorrhage	20	6.7
Hydrops fetalis	3	1.0
Pulmonary hemorrhage	1	0.4
	301	100.0

Eighteen out of 54 cases of infection revealed positive culture results. Infecting agents were determined as Echerichia coli (n = 5, 25.7%), Streptococcus epidermidis (n = 3, 16.7%), Klebsiella pneumoniae (n = 3, 16.7%), Pseudomonas aeruginosa (n = 3, 16.7%), Enterobacter aerogenes (n = 2, 11.1%), and Staphylococcus aureus (n = 2, 11.1%). Since most of the autopsies were performed 12 hours after death, bacteriologic examination could not be done due to contamination from the environment. In the limited number of autopsies (3.5%) in which bacteriologic examination was performed, parallel findings with clinical culture results were observed.

The autopsy diagnoses from highest to lowest rate of occurrence were infection, hyaline membrane disease, congenital anomalies, perinatal hypoxia-asphyxia and severe immaturity (Table IV).

Table IV: Autopsy Diagnoses of 301 Neonatal Death Cases (1988-1991)

Autopsy Diagnosis	Number of Cases	Percentage (%)
Infection	74	24.7
Hyaline Membrane Disease	73	24.3
Congenital Anomalies	58	19.3
Hypoxia-Asphyxia	40	13.4
Intracranial Hemorrhage	24	8.0
Immaturity	24	8.0
Pulmonary Hemorrhage	4	1.3
Hydrops Fetalis	3	1.0
	301	100.0

In the 300 fetal death cases on which autopsy was performed, the main diagnoses were 138 cases of anoxia (46%), 61 cases of congenital anomalies (20.3%), 16 cases of intracranial hemorrhage (5.3%), 13 cases of infection (4.4%), and seven cases of pulmonary hemorrhage (2.4%) (Table V).

Table V: Autopsy Diagnoses of 300 Fetal Deaths

Autopsy Diagnosis	Number of Cases	Percentage (%)
Anoxia	138	46.0
Congenital Anomalies	61	20.3
Intracranial Hemorrhage	16	5.3
Infection	13	4.4
Pulmonary Hemorrhage	7	2.4
Hydrops Fetalis	6	2.0
Twin Pregnancy Complications	3	1.0
Immaturity	1	0.3
Coagulation Anomalies	1	0.3
Nondiagnostic due to Autolysis	54	18.0
	300	100.0

When clinical and autopsy diagnoses were compared in 301 newborn cases, in 204 of them the findings correlated well (67.8%), while in 97 cases the disease and the primary cause of death could not be found clinically but were diagnosed through autopsy. The discordance rate between the clinical and pathological diagnoses was 32.2 percent. In 69 cases (23%), in addition to clinical diagnoses the autopsies revealed some additional findings which did not lead to death.

Among the main diagnoses with the highest discordance rates were pulmonary hemorrhage, infection and intracranial hemorrhage (Table VI).

Table VI: Comparison Between Clinical and Autopsy Diagnoses of 301 Neonatal Deaths

Diagnosis	Number of Cases		Discordance Rate (%)
	Clinic	Autopsy	
Pulmonary Hemorrhage	4	1	75.0
Infection	74	54	27.0
Intracranial Hemorrhage	24	20	16.7
Immaturity	24	20	16.7
Congenital Anomalies	58	51	12.1
Hyaline Membrane Disease	73	67	8.2
Hydrops Fetalis	3	3	0.0

Discussion

Autopsy was performed in our unit in 91.9 percent of cases overall, rising from a low of 77.3 percent in 1988 to 96.8 percent in 1991 (Table I).

In the United States, the hospital autopsy rate, which was greater than 50 percent in the 1940s, dropped to 15 percent by 1985[11]. In Germany this percentage is 8-10[12]. Graft et al.[11] reported the neonatal autopsy rate in the first three years as 63 percent based on the records of a tertiary newborn intensive care unit. In Belgium, Wals et al.[13] reported the neonatal autopsy rate ase 51 percent, and in India, Singh et al.[14] reported the rate as 43.9 percent. The main reasons for the high autopsy rate in our unit include: the special emphasis placed on this method, the possibility of obtaining easier permission for autopsy from families through emphasizing the importance of this method in reaching a correct diagnosis and in determining the precautions that need to be taken in subsequent pregnancies, and the provision of financial support towards the cost of autopsy by the Pathology Department of our Faculty. Another important reason for the high autopsy rate is the effective collaboration between our unit and the Pathology Department. In this way, the important obstacle that caused significant reductions in the autopsy rates mentioned in the literature has been successfully avoided[11, 15-23].

More than half of the 301 newborns (52.5%) were lost in the first 24 hours of life (Table II). Mattos et al.[24] determined in a study in Brasil over a five-year period that the percentage of deaths in the first 24 hours was 42 percent.

Examination of the clinical findings of the autopsies performed on 301 newborns revealed that the major causes of death were, in descending order of frequency, hyaline membrane disease, infection, congenital anomalies and perinatal hypoxia-asphyxia (Table III). In India, Singh et al.[14], in their study on 755 newborn autopsy cases, determined that the primary causes of death were infections (27.2%), hyaline membrane disease (20.2%) congenital anomalies (19.6%) perinatal hypoxia-asphyxia (14.5%), immaturity (5.1%) and birth trauma (2.7%). Craft et al.'s[11] findings on 71 newborn autopsies listed diagnoses as congenital anomalies (16 cases), infections (nine cases), iatrogenic complications (five cases) and others (11 cases). In Agapitos et al.'s[25] work, the causes were listed as hyaline membrane disease, infection, congenital anomalies, anoxia and immaturity.

In our study, the first five primary diagnoses determined through autopsy were infection (24.7%), hyaline membrane disease (24.3%), congenital anomalies (19.3%), perinatal hypoxia-asphyxia (13.4%) and immaturity (8%). These results correlated with Singh et al.'s[14] results. The above diagnoses were followed by 24 cases of intracranial hemorrhage (6%), four cases of pulmonary hemorrhage (1.3%) and three cases of hydrops fetalis (1%) (Tables IV, V).

The fact that infection is the primary autopsy diagnosis highlights an important problem in our unit. The infection of the newborn during the antepartum, intrapartum and postpartum periods cannot be avoided in our unit since regular antenatal follow-up of the mothers cannot be done and aseptic conditions in the labor room, operation room and neonatal unit cannot be properly implemented due to a personnel shortage.

In our unit, asphyxia remains an important perinatal problem. In order to minimize the asphyxia risk, prenatal follow-up should be done properly, the neccessary obstetric procedures should be timely and adequately chosen, and appropriate resuscitation along with effective neonatal care should be provided. However, under even optimum conditions, the asphyxia rate can be as high as 10 percent[26].

When clinical and autopsy findings were compared in 204 out of 301 newborn cases according to the primary cause of death, clinical and autopsy diagnoses correlated well (67.8%). In 97 cases, however, the main disease and the primary cause of death could not be determined clinically but could be found through autopsy. Thus, the discordance rate between the clinical and pathologic diagnoses was found to be 32.2 percent. In 69 cases (23%), in addition to the major cause, additional diagnoses which did not lead to death were determined through autopsy. Most of these causes were genetic anomalies. Among the diagnoses in which the discordance rate was highest were pulmonary hemorrhage (75%), infection (27.2%) and intracranial hemorrhage (16.6%).

In the literature, the discordance rate reported between clinical and pathologic diagnoses ranges between five and 40 percent[3]. Among the diagnoses with the highest discordance rates are cardiovascular system diseases, infections and tumors[27,28]. The fact that pulmonary hemorrhage and infections were the causes with the highest discordance rates in our series could be explained by the inefficient and delayed applications of some diagnostic methods such as radiographic examination and microbiological tests, since most of the cases were lost within the first 24 hours. A further explanation would be that an exact diagnosis could not be derived because in newborns, the infection's clinical and laboratory findings were not specific.

Despite all technical means, the high discordance rate between the clinical and pathologic diagnoses again emphasizes the importance and necessity of autopsy. Fetal and neonatal autopsy findings not only provide the correct diagnosis, but they also help in subsequent pregnancies to decide on genetic counseling and other methods that should be applied.

We believe that efficient collaboration is necessary between perinatologist, neonatologist and pathologist to emphasize the importance of newborn and fetal autopsies and to increase the autopsy rates.

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