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# Placental pathology in intrauterine fetal death

Nanda J. Patil, Jyoti S. Tele*, Rohit S. Kadam, Pawar S. J, Sujata M. Kumbar

Department of Pathology, Krishna Institute of Medical Sciences "Deemed to be University", Malkapur, Karad, Satara-415539, Maharashtra, India

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ABSTRACT

Placenta is the most accessible and readily evaluable specimen which is mirror image of pregnancy. The objective here is to study the histomorphological changes in placenta in cases of intrauterine fetal deaths and to study correlation of placental findings with causes of fetal death which is significant to understand. The present cross sectional study was carried out in Department of Pathology of a tertiary care hospital from June 2015 to May 2017. Study of Placental Pathology in Intrauterine Fetal Death cases comprised of 99 placentas. The present study was undertaken to study the placental pathology in cases of intrauterine fetal death. IUFD was found to be more common in primigravida 50/99 (50.50%) mothers. Placental study gives useful morphological information regarding the abnormality of pregnancy. Gross and microscopic examination of the placenta plays an important role in identifying the underlying causes of fetal death and helps prevent further recurrence by making appropriate interventions during the next pregnancy. Study of placental pathology gives clues to events occurring throughout gestation and can potentially help to answer, questions concerning pregnancy management and risk assessment of future pregnancies. It will help the researchers who are doing the research in the field of placental pathology in the days to come.

*Corresponding Author

Name: Jyoti S. Tele
Phone:
Email: Drjyoti.s@hotmail.com

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## INTRODUCTION

Placenta is the most accessible and readily evaluable specimen which is mirror image of pregnancy. Examination of placenta provides record of pregnancy, in which the cumulative effects of pregnancy related events and changes reflecting the intrauterine environment can be scrutinized. Unfortunately the cause of death is reported as unexplained sometimes up to two third of intrauterine deaths. (Fretts, 2005; Goldenberg *et al.*, 2004) There is intensifying demand on medical, social, and epidemiological grounds for proper determination of the causes. Considering the above facts, the study of Placental Pathology plays an important role in the diagnosis of causes of fetal death and prevention of further recurrences. The present study was undertaken to study the placental pathology in cases of intrauterine fetal death.

## AIM AND OBJECTIVES

### Aim

To study Placental Pathology in cases of intrauterine fetal deaths.

### Objectives

To study the histomorphological changes in placenta in cases of intrauterine fetal deaths. To study cor-

relation of placental findings with causes of fetal death.

## REVIEW OF LITERATURE

In 1880, Waldeyer gave a full account of intervillous space and confirmed the existence of basal uterine veins draining into the intervillous space. (Benirschke, 1991) was the first to standardize the protocol for placental examination, gross and microscopic, in correlation with the clinical data, specifically with the health of developing baby.

(Fox, 1978; Macpherson, 1991), for the first time introduced histometric studies of placenta. He advocated the technique of counting a fixed number of villi and if it exceeds normal limits, it is taken as pathological. These histometric studies provide a line between normal and abnormal changes in the villi.

The trophoblast forms from the outer cell mass of the blastocyst. These cells further proliferate and infiltrate in between the endometrial epithelium and come into contact with stroma, as the former generates. During the fourth month cytotrophoblast proliferates into maternal decidual vessels, partially replacing the endothelium. It also invades the tunica media. This process is accompanied by fibrinoid necrosis of the musculo-elastico tissue. This physiological phenomenon allows for accommodation of greatly augmented blood flow as pregnancy advances. The definitive form of the placenta is attained by the end of fourth month of pregnancy. (Fox, 1978; Boyd and Hamilton, 1967)

Placental sub-unit known as fetal lobule (approx. 200 lobules).The chorionic or terminal villi are the functional unit of the placenta. Each villous consist of fetal capillary lined by endothelium. The capillary is contained in the loose connective tissue core of the villous along with large mono-nuclear cells called hofbauer cells, which are phagocytic in nature. The trophoblast covering of each villous consists of two layers. The cytotrophoblast also called as langhans layer consist of large discrete pale cells with relatively large nuclei. This layer disappears gradually as pregnancy advances to term. The second layer is syncytiotrophoblast which is dark and variable in thickness in which numerous small nuclei are irregularly disperses. This layer becomes progressively thinner throughout pregnancy. At intervals along with a villous, the syncytium is aggregated into protuberance of cytoplasm that contains many nuclei; these are called as syncytial knots. Ultra structurally, apart from the brush border, the syncytiotrophoblast has receptor sites for plasma proteins such as transferrin and transcobalamin. It's cytoskeleton consists of structural proteins actin, tubulin etc. It's organelle consists of lysosomes, rough endoplasmic reticulum, Golgi apparatus, mitochondria etc. It synthesizes, stores and metabolizes various molecules like proteins, lipids and carbohydrates. It also synthesizes some membrane bound and intracellular enzymes (Fox, 1978; Novak, 1991). The placenta principally functions as an organ of transfer of nutrients, gases and waste products. It also synthesizes proteins and enzymes necessary for normal functioning of the organ. e.g. respiratory enzymes and enzymes necessary for steroid hormone synthesis (oestrogen and progesterone). It also secrets placental products like HCG, HPL and placental alkaline phosphatase which are secreted through gene control. Trophoblast is the source of secretion of these hormone and enzymes, while uteroplacental blood flow control the secretions. Various obstetrics pathologies have an effect on synthesis and or secretion of placental products e.g. edema of the chorionic villous associated with fetal hydrops, leads to decrease in the synthesis of placental products.

The definition of an intrauterine fetal death varies across countries. A universally agreed upon definition of intrauterine fetal death is the death of fetus in uterus after 28 weeks of pregnancy and before the birth of the baby. Intrauterine fetal death is one of the leading problems faced by obstetricians during their routine practice (Whitfield, 1995; Crowther, 1995; Bocciolone *et al.*, 1994). However, in the cases where cause of IUFD is clearly determined, the cause can be referred to fetal, maternal, or placental pathology. Placental pathology shows maternal (placental) floor infarct. 84 But in most instances, placental studies have not been recorded.

Amniotic fluid provides the medium for free fetal movements and has a cushioning effect to prevent possible fetal injury. Secretions of amniotic epithelium and, from about the fourth month of gestation, fetal urine are the main source of amniotic fluid. Cellular and non cellular debris from the desquamated epithelial cells of the skin, respiratory tract, and urinary tract is also present. The amount of amniotic fluid at mid pregnancy and term is about 400 and 1000 ml, respectively (Joshi, 1994a). The presence of an excess of amniotic fluid is called hydramnios or polyhydramnios. A diminished amount is called oligohydramnios. A quantification is based on the addition of multiple ultrasound measurements, called the amniotic fluid index, is commonly used. An index below 5 cm is abnormally low (oligohydramnios) and an index of 24 cm or more indicates hydramnios. In a consecutive series of 672 pregnancies complicated by hydramnios, of the

fetuses had significant abnormalities, mainly malformations (Dashe, 2002).

The recipient twin affected by twin-twin transfusion syndrome commonly has hydramnios. The most common cause of oligohydramnios is leakage of amniotic fluid caused by premature rupture of membranes, bilateral renal agenesis, and fetal urinary tract obstruction. Also occurs in fetal malformations, abnormal karyotypes, growth restriction, post term pregnancies, preeclampsia, and donor twin in twin-twin transfusion syndrome and chronic partial placental abruptions (Shenker *et al.*, 1991). Abdominal trauma (of which automobile accidents or a fall from stair case is the most common cause) can result in placental abruption and retroplacaental fetal bleeding. Retroplacental hematoma may be present. Contusion and tears of the placenta may lead to bleeding into the amniotic sac. Bruises of the villous tissue with severe intervillous hemorrhage can also occur. Concurrent fetal injuries including skull fracture, with or without cranial hemorrhage, have also been recorded. (Joshi, 1994b)

## MATERIALS AND METHODS

Study of Placental Pathology in cases of Intrauterine Fetal Death was a cross sectional study carried out in the Department of Pathology in a tertiary care hospital from June 2015 to May 2017 for detection of placental pathology of intrauterine fetal death. Material for the present study comprised of 99 placentas obtained from the cases of IUFD, delivered in the Department of Obstetrics and Gynecology of a tertiary care hospital. These 99 placentas were received in the Department of Pathology along with clinical details for histomorphological study.

### Observations and Results

Study of Placental Pathology in Intrauterine Fetal Death was a cross sectional study carried out in the Department of Pathology in a tertiary care hospital. Placentas from cases of Intrauterine Fetal Death during the period of 2 years from June 2015 to May 2017 were studied and related data were analyzed. During the study period of two years from June 2015 to May 2017, total 167 cases of intrauterine fetal death were noted in our hospital. Amongst 167 cases of IUFD, 99 cases had fetuses of gestational age more than 28 weeks, were included in the present study.

As seen in Table 1, majority of cases were noted between age group of 21-25 years (49.49%), followed by age group 26-30 years(31.31%). Youngest case was a 19 years old mother and oldest was of 35 years.

As seen in Table 2, maximum number of IUFD 50/99 (i.e. 50.50%) belonged to primigravida mothers, followed by 46 (i.e.46.47%) to multigravida and 3 (i.e. 3.03%) were from grand multigravida.

Above Table 3, shows distribution of cases according to weight of placenta from IUFD fetuses, 79/99 cases (i.e.79.80%) belonged to placental weight in between 200 to 500 gms, 18/99 cases (i.e. 18.18%) showed placental weight less than 200 gms, and only two cases (i.e. 02.02%) had placental weight more than 500 gms.

As shown in the Table 4, maternal causes were seen in 70/99 cases (i.e. 70.70%), placental causes were seen in 24/99 cases (i.e. 24.25%) and fetal causes were seen in 4 cases. A single case had history of fall from stair case i.e. trauma as cause of IUFD included as other.

## DISCUSSION

Although many studies have been undertaken on placental pathology and intrauterine fetal death so far, very few studies have been actually used parameters which are comparable with each other, thus making an exhaustive comparative discussion difficult. In order to study Placental Pathology in Intrauterine Fetal Deaths, both maternal clinical parameters as well as placental pathology need to be taken into an account. IUFD is a traumatic experience for both mother and the clinicians. Despite the advances in fetomaternal medicine the IUFD rate continues to be high 22.1/1000 live births (Patel *et al.*, 2014). Intrauterine fetal death has profound emotional effect on mother. In additional to that loosing baby gives not only blame but also physical and mental burden to mother. The fetus, placenta and mother form a composite triad of dynamic equilibrium, and dysfunction of any one of these can affect the other. The awareness regarding intrauterine fetal mortality and its preventable causes is increasing. It has led to increase in finding the preventable causes of death in antenatal period. Few of them are preventable by acquiring few simple measures such as regular hospital visits, appropriate treatment and follow up during antenatal period.

In few cases fetal deaths during subsequent pregnancy are known to recur; physicians are interested in finding the underlying cause of recurrence. Gross and microscopic examination of placenta plays a vital role in identification of underlying causes of fetal death and helps to prevent further recurrence by taking appropriate interventions during next pregnancy.

 

**Table 1: Showing distribution of IUFD according to maternal age**

| Maternal age group in years | Number of cases (n=99) | Percentage (%) |
|---|---|---|
| <20 | 11 | 11.11 |
| 21-25 | 49 | 49.49 |
| 26-30 | 31 | 31.31 |
| >30 | 08 | 8.09 |
| Total | 99 | 100 |

**Table 2: Showing distribution of IUFD according to gravid status of mother**

| Gravida | Number of cases (n) | Percentage (%) |
|---|---|---|
| Primigravida | 50 | 50.50 |
| Multigravida (>2) | 46 | 46.47 |
| Grand Multigravida (>5) | 03 | 3.03 |
| Total | 99 | 100 |

**Table 3: Showing distribution of IUFD cases according to weight of placenta**

| Weight of placenta in grams | Number of cases (n=99) | Percentage (%) |
|---|---|---|
| < 200 gms | 18 | 18.18 |
| 200-500 gms | 79 | 79.80 |
| >500 gms | 02 | 02.02 |
| Total | 99 | 100 |

**Table 4: Showing various causes of intrauterine fetal death**

| Causes of IUFD | Number of cases (n=99) | Percentage (%) |
|---|---|---|
| A)Maternal | 70 | 70.70 |
| B)Placental | 24 | 24.25 |
| C)Fetal | 04 | 04.04 |
| D)Other | 01 | 01.01 |
| Total | 99 | 100 |

## CONCLUSIONS

The present study was conducted to study placental pathology in cases of intrauterine fetal death at our institute. In the comprehensive evaluation of intrauterine fetal death cases, placental examination contributes enormously, and can help to identify reasons for the demise of fetus. Placental study gives useful morphological information regarding the abnormality of pregnancy. In the present study pregnancy induced hypertension (PIH) was the most common cause (43%) associated with maternal morbidity and intrauterine fetal deaths. PIH leads to uteroplacental insufficiency and shows various lesions in placenta viz. infarction, retroplacental hematoma and microscopically cytotrophoblastic proliferation, fibrinoid necrosis etc. The lesions in the placenta reflected the severity of the clinical manifestations in mother. Placental ischaemia due to reduced uteroplacental blood flow leads to adverse effects on fetus viz. intrauterine fetal growth retardation, intrauterine fetal death and increased perinatal morbidity and mortality. Thus the study of placental pathology gives clues to events occurring throughout gestation and can potentially help to answer, questions concerning pregnancy management and risk assessment of future pregnancies.

### Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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