ORIGINAL RESEARCH PAPER

Radiodiagnosis

ASSESSMENT OF TWIN PREGNANCIES IN ANTENATAL ULTRASOUND STUDIES (HOSPITAL-BASED RETROSPECTIVE STUDY) IN A TERTIARY CARE HOSPITAL IN GARHWAL.

KEY WORDS: twin pregnancies, ultrasound, twin-twin transfusion syndrome, stuck twin

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ABSTRACT

The present record based study done in the tertiary care hospital situated in hills of Garhwal region is done to assess the prevalence of the twin pregnancy on antenatal ultrasound study in local population and the burden of any abnormalities related to twin gestation during this period. Serial ultrasound assessment with Doppler evaluation is gold standard to diagnose twin gestation and fetal complications related to twin gestation like stuck twin, feto-fetal transfusion syndromes, fetal discordant growth, and other issues like preterm labor and others. We found overall prevalence of 0.95% twin gestation in local hilly population of Garhwal as ours is the only tertiary care hospital in the Garhwal region right from Char Dham to Rishikesh with good patient turnout in hospital outpatient department.

INTRODUCTION:

Twin pregnancy is commonly associated with relatively more pregnancy-related maternal as well as fetal complications during intranatal and perinatal period with relatively little poor pregnancy outcome as compared to singleton pregnancy. Ultrasonography (USG) has revolutionized the antenatal care of gravid females having twin pregnancy helping with early diagnosis and determination of chorionicity, structural fetal abnormalities and assessment of aneuploidies in such twin pregnancies. Twin specific issues include twin -twin transfusion syndromes (TTTS), monochorionic monoamniotic twin placentation, congenital twin variant like Siamese twins, with management related decisions regarding one twin impacting the outcome of the other twin.

Ultrasound assessment aided with color Doppler is used as first diagnostic modality of choice to diagnose twin gestation along with the details of placentation, cervical length, fetal anomalies, discordant fetal growth, status of liquor, viability of fetus or embryo, any vascular connections, status of chorionicity and other important details which aid in clinical management of the gravid woman, the advice to be given to the patient and in prediction of the outcome of pregnancy. Antenatal ultrasound study is now considered vital and integral part of antenatal care and diagnosis of multiple pregnancies is easily done with serial assessment wherever and whenever needed to monitor the gestation vigilantly during antenatal and perinatal period. In the present hospital based retrospective study of assessment of twin pregnancies in gravid patients referred for antenatal ultrasound in our hospital situated in hills of Garhwal in the state of Uttarakhand, we have found about 0.95% overall prevalence of twin pregnancies in local population and about 0.24% burden of abnormal twin pregnancies in the study done over a period of two years. We will consider the relevant findings of ultrasound in this subset of gravid females with result oriented discussion and comparison with other antenatal studies done in India.

Total 1697 antenatal ultrasound studies were done in years 2016 and 2018, out of which 16 cases of twin pregnancies were found on antenatal ultrasound study in our study (n = 16), giving overall prevalence of twin pregnancies in our study to be 0.95%, which correlates well with studies showing overall prevalence of twin pregnancies of 0.95 to 1 % in Indian population.

Materials and methodology:-

The present record based study was performed in the ultrasound section of the department of Radiology, HNB Base Government teaching hospital, Srinagar Garhwal situated in hills of Garhwal. Total 1679 antenatal ultrasound patients were scanned in year 2016 and 18 over a period of two years with about 16 cases of twin pregnancies detected in gravid females referred for antenatal USG. Obstetric ultrasound was done with convex transducer with 2 to 3.5 MHz frequency on L& T Sonalisa USG machine and Toshiba Nemio SSA 510A (Toshiba Inc Corporation, Tokyo, Japan) color Doppler machine with patient in supine position with ultrasound coupling gel put over abdomen, in presence of female attendant. Scanning is done in both longitudinal and transverse planes and entire uterine cavity and cervix is visualized. A pre-designed format was used for data collection and data related to maternal age, parity, past history of live births / stillbirth / miscarriages, socioeconomic status, clinical symptoms, ultrasound findings, fetal viability, malformation if any, and fetal lie and presentation was collected in the proforma. The data thus obtained was retrieved on a Microsoft excel datasheet and variables like age, sex, clinical symptomatology and ultrasound findings assessed and tabulated with statistical methods using percentage prevalence of each variable.

On ultrasound, scanning of entire uterine cavity is done with counting of embryos or fetuses, assessment of placenta whether single or two, along with determination of fetal presentation and lie, fetal situs, and assessment of liquor and cervical length in every antenatal ultrasound scan. Transabdominal ultrasound (TAS) is used usually however in early first trimester transvaginal sonography (TVS) is preferred in general.

Ultrasound based results: - * Kindly refer to Tables I to V.

We found 16 cases of twin pregnancies on antenatal ultrasound studies out of total 1679 antenatal ultrasound studies in our record based study done in our hospital giving an overall prevalence of 0.95% of twin pregnancies on ultrasound in hilly population of Garhwal. Overall burden of abnormal twin pregnancies in local hilly population of Garhwal on antenatal ultrasound was 0.24%. Kindly refer to tables I to V for distribution of variables including age, regions, symptoms, ultrasound findings and other relevant features. Common presentation was monochorionic, diamniotic twin pregnancy (nine cases), followed by dichorionic, diamniotic twin pregnancy (five cases) and monochorionic monoamniotic twin pregnancy (two cases). Out of these twins, four twin pregnancies had abnormal findings and rest were normal. Most of the cases were referred from Pauri and Rudraprayag (RPG) districts, (11 cases) and remaining were from Tehri and Chamoli districts. All abnormal twin pregnancies were done as emergency cases and rest 12 cases were done on routine basis. The age group of the women having twins was from 21 to 34 years, with mean age of about of 25.31 years. All twin pregnancies except were assessed in second (5 cases) and third (10 cases) trimester whereas only one female of 25 years age presented in first trimester. Majority of twin pregnancies had live intrauterine fetus except only one case in third trimester which had dead stuck twin resulting from feto-fetal transfusion syndrome. Overall three cases of feto-fetal transfusion syndromes were found, two in third trimester and one in second trimester. The dead stuck twin had additional finding of type II posterior placenta previa with history of vaginal bleeding and pain in lower abdomen. Dead stuck twin was relatively very small as compared to recipient live twin, appearing as a macerated deformed fetus on ultrasound. MTP was advised in this case as other live twin had serous collections, truncal edema with findings of hydrops fetalis with poor chance of survival. Another case of TTTS had donor stuck twin of EFW of 1340 gms and recipient twin had EFW of 1840 gm

wt. The stuck twin had oligohydramnios whereas the recipient twin had normal liquor with normal growth and fetal development. Twin peak (lambda sign) was seen on ultrasound of a average 9 weeks gestation with dichorionic diamniotic twin live gestation and small bland subchorionic bleed [Figure 3]. Second trimester case of TTTS had live donor twin of 17 week 1 day GA by ultrasound and oligohydramnios whereas the live recipient twin had polyhydramnios with GA of 21 week 4 days on ultrasound. 31 year old lady presented with vaginal bleeding with small subchorionic bleed in presence of diamniotic dichorionic twin live gestation on ultrasound.

DISCUSSION

We will now elaborate on the etiology of twin gestation and placentation, the various fetal complications related to twin gestation, ultrasound features of various types of twin pregnancies, some relevant clinical material pertaining to our case results and studies as well as some relevant treatment modalities in paragraphs that follow.

General considerations:-

Twin pregnancy is a type of gestation in which the mother gives birth to two offspring from the same pregnancy. Incidence of twin pregnancies in India population is about 0.9 to 1% and two studies done in India one in Hyderabad and other in Ranchi, reveal bit higher values of 1.16% and 1.85% respectively with occurrence of twin pregnancies more so in multigravida, and those having undergone assisted reproduction techniques[2, 3]. The age group having twin gestation was between 20 to 25 years[1, 2, 3]. Common fetal complications found were preterm labor, malpresentations, fetal growth discordancy, and malformation of fetuses[1, 2, 3]. Perinatal mortality was higher in fetuses with low birth weight of 1 to 1.5 kg[2]. Overall prevalence of twin pregnancies in Asian population is 0.6% of all pregnancies[2]. It can be either monozygotic or dizygotic. Pregnancy outcomes in developing countries are relatively poor due to lack of good healthcare facilities, poverty, ignorance, unhealthy social customs which lead to twin pregnancies having almost 10% of global perinatal mortality[2]. In one study, perinatal mortality rate of monochorionic gestation was 30% and that of dichorionic gestation was 10.2%[3]. 14 to 25% of twin pregnancies have fetal growth restriction, increased incidence of cerebral palsy, and almost four times higher fetal death rates than singleton pregnancies[1].

Other fetal complications in twins are single fetal demise, cord prolapse, conjoined twins, stuck twin, interlocked twins, aneuploidies like Down's syndrome and liquor abnormalities[1, 2]. Oligohydramnios is seen due to stuck twin, renal anomalies; whereas hydramnios is seen with monozygotic twin pregnancies as well as dizygotic twin pregnancies[1, 2, 3, 5, 7, 8]. Fetal discordancy is due to IUGR, TTTS and fetal anomalies[1, 2, 3]. The perinatal mortality increases with increasing degrees of fetal discordancy[2, 3]. To add, LSCS is advised in severe cases of discordant twins to avoid perinatal fetal death[2]. The risk of co-twin demise and neurological disorders increases in monochorionic twin gestation as compared to dichorionic gestation[2]. Congenital fetal anomalies in twins are due to defects related to twinning and vascular anastomoses, and fetal crowding[1,2,3]. Chorionicity should be assessed on USG in twin pregnancies as structural abnormalities; deformities are common due to fetal crowding in such gestations and can be detected as early as 16 weeks where in level II ultrasound can be performed with confidence[4].

In one study, 65% of twin pregnancies were dichorionic diamniotic type and 32% were of monochorionic monoamniotic type[3]. Before the advent of ultrasound, it was estimated that about 50% of twin pregnancies were detected only at the time of delivery[1]. Now without ultrasound we cannot imagine an antenatal scenario as it has become part and parcel of clinical and diagnostic assessment of gravid woman in any clinical setup be it public or private sector. Clinically woman with twin pregnancy present with uterine size larger than expected size, high incidence of hyperemesis gravidarum, pre-eclampsia, and have history of assisted reproduction techniques, especially in older fertile women[1].

Aetiology of twin gestation[1,2]

In twin gestation, there are two embryos with one or two placentas, so twins are either monozygotic or dizygotic, depending on the number of Ova fertilized at the time of conception. Monozygotic (identical) twins result from one ovum being fertilized by a sperm that divides into two embryos within 14 days after fertilization. Monozygotic twinning is about 1/250 pregnancies across the world. The time of cleavage of fertilized ovum determines the type of placentation and the incidence of complications: 1) dichorionic diamniotic twin (one third of all) - cleavage on day 0- 3 2) monochorionic diamniotic twin (two thirds of all) - cleavage on day 4- 8 3) monochorionic monoamniotic twin (< 1%) - cleavage on day 9- 12[1]. [Figure 2 and 3]

Dizygotic (fraternal) twinning is due to two ova fertilized by two different sperm at same time. The type of placentation is the most important predictor of twin pregnancy related complications.

First trimester ultrasound assessment of twin pregnancy and placentation (chorionicity) and later ultrasound assessment of twin pregnancy related complications[1,2,3,4,6,9]:

Transabdominal sonography (TAS) and transvaginal sonography (TVS) both are utilized to assess the presence of twin pregnancy, number of gestational sacs, amnion and yolk sacs. 'Twin peak sign' (lambda sign) indicates a dichorionic twin pregnancy in which a thick fused membrane is seen like a lambda or triangle at the site of insertion over placenta. If a thin wispy membrane joins the chorionic plate of placenta at right angles ('T-sign'), it suggests a monochorionic diamniotic twin pregnancy[1]. 'Ipsilon sign' indicates a triplet trichorionic pregnancy wherein three gestational sacs meet like an Ipsilon[1]. Two separate placentas indicate dichorionic gestation. Single formed placenta indicates monochorionic gestation. When the dividing membrane is not seen in early first trimester on serial ultrasound evaluation, it suggests monochorionic monoamniotic twin pregnancy[1].

Later on, from 12 week or more till term, a two-weekly ultrasound is suggested in known twin pregnancies with normal fetuses while an one-weekly ultrasound is suggested in twin gestation with any abnormal findings in gestation to avoid early detection of progression of the condition in question and to prevent fetal losses[1, 2, 3, 4, 8]. It is done especially to detect TTTS, preterm labor and congenital anomalies in monochorionic diamniotic twin pregnancies[1,2].

Cord entanglement is a sign of monochorionic monoamniotic twin pregnancy seen as cord mass, which on Doppler shows entangled cord with narrowing of umbilical vessels with reduced diastolic flow and notching[1]. Velamentous insertion of cord into membranes of placenta rather than chorionic plate is quite common in monochorionic monoamniotic twin placentation[1].

Daily antenatal surveillance after viability testing with daily non-stress tests, steroid therapy to attain fetal lung maturity and delivery by LSCS after 33 to 35 week gestation when lung maturity is attained, forms main stay of treatment in such gestations[1, 2, 3]. Cervical length assessment also forms an important step in assessment of twin pregnancies wherein studies indicate length greater than 35 mm are favorable and length less than 25 mm, suggests high incidence of preterm labor[1]. Cervical cerclage is offered to patients with cervical length less than 25 mm, however strict bed rest also gives good results[1]. Selective termination of anomalous fetus is suggested in dichorionic twin pregnancies by transabdominal KCl injection into fetal heart. Identification of such anomalous twin pregnancies can help to plan therapeutic fetal interventions or preventive interventions like release of amniotic bands, laser fetoscopy to produce amniotic septostomy in feto-fetal transfusion syndromes to save donor twin which has oligohydramnios and then can grow adequately without deformity and growth restriction[4,5].

Aneuploidies are seen associated with twin pregnancy especially Down's syndrome, in advanced maternal age and assisted reproduction techniques in women who usually are older[1]. Screening by serum tests, ultrasound and by use of chorionic villus sampling followed by karyotyping is suggested to detect

aneuploidies[1]. For Down's syndrome, serum tests of β-HCG and PAPP-A (pregnancy associated plasma protein A) in addition to ultrasound to detect sonographic markers are suggested[1]. On USG presence of 1) nuchal translucency in early first trimester 2) second trimester markers like major anomalies, cardiac anomalies, increased nuchal fold thickness, short femur and humerus, echogenic bowel, ventriculomegaly, and renal pyelectasis 3) soft markers like echogenic cardiac focus, choroid plexus cysts, two vessel cord, clinodactyly, sandal gap deformity, and wide pelvic angle, suggest aneuploidies like Down's syndrome[1].

We will now deal with various types of twin pregnancies:-

a) Vanishing twin[1] - it indicates the twin gestation diagnosed on ultrasound in early first trimester, which eventually results on singleton live birth. It results from a dichorionic twin pregnancy and represents almost 20% of such twin pregnancies according to one study.

b) Fetus papyraceous[1]: is a mummified remnant of the lost twin found in the placental folds after delivery of the surviving twin.

c) Stuck twin[1,2,3,4,5]: the term represents a twin with oligohydramnios that adheres to the sidewall of the uterus and remains confined to that area, whereas the other twin has normal or raised liquor. It results from fetus having bilateral renal agenesis, bilateral severe renal anomalies, severe IUGR with oligohydramnios or from TTTS. In case of TTTS, the recipient twin has polyhydramnios. Dividing membrane can be seen on ultrasound along fetal neck, limbs and chin. The other twin may be hydropic. Diagnostic amnioinfusion is done to visualize fetal structural details.

d) Twin -twin transfusion syndrome (TTTS): [1,2,3,4,5,7,8,9]
A stuck twin with TTTS is suggested when i) there is single placenta ii) same sex fetus iii) stuck twin with severe oligohydramnios iv) polyhydramnios in the other twin v) velamentous insertion of cord vi) no bladder in donor twin vii) discrepant fetal size with recipient twin quite larger than donor twin. It occurs during to arterio-venous and arterio-arterial anastomoses in the placenta leading to unidirectional or unbalanced blood flow giving rise to anemia in donor twin and polycythemia in recipient twin[1]. In early first trimester, the recipient twin shows increased nuchal translucency[1].
Quintero et al suggested staging of TTTS as below[1]:
1) Stage I: bladder of donor twin is still visible
2) Stage II: bladder is not visible but Doppler evaluation is normal
3) Stage III: abnormal Doppler findings
4) Stage IV: fetal hydrops seen.
5) Stage V: fetal demise one or both twins.

Higher staging only indicates high perinatal mortality[1]. Untreated TTTS which develops before 26 week has 90% perinatal mortality[1]. Treatment of TTTS is done by 1) laser photocoagulation of offending communicating vessels in placenta 2) serial amnioreduction of the polyhydramnios around recipient twin 3) cord ligation of recipient twin / anomalous twin / hydropic twin 4) termination of pregnancy suggested in early onset severe TTTS. 5) Needle hole amnioseptostomy of the intervening twin membrane[1,2,3,4,5,6,9].

e) Acardiac twin[1]: it is a rare unusual form of monochorionic twin pregnancy, rather a severest variant of TTTS in which the recipient twin has severely hypoplastic heart and hydrops, leading to cardiac dysfunction[1]. This results from TRAP sequence - twin reverse arterial perfusion, in which anastomoses channels supply deoxygenated blood to the very abnormal recipient twin in head and upper trunk region, whereas oxygenated blood goes from umbilical arteries to lower half of body[1]. Thus a deformed twin results with vestigial head and heart and well-formed caudal parts. Treatment is done by 1) ablation of deformed acardiac twin after serial ultrasound assessments.2) ablation procedures include cord occlusion of twin, intrafetal ablation of communicating vessels by interstitial laser ablation, alcohol ablation, monopolar diathermy, and Radio-frequency ablation, RF ablation being procedure of choice[1].

f) Conjoined (Siamese) twins [1]: It is a rare unusual occurrence in a monochorionic monoamniotic twin pregnancy in which the embryo divides at 13- 15 days after conception, leading to two fetal poles attached at varying sites with varying degrees of severity, commonest forms being 'omphalopagus' and 'thoracopagus' siamese twins, which are attached at abdomen and chest respectively. Early USG finding in a siamese twins is a bifid appearing fetal pole.

CONCLUSION:
Twin pregnancies pose interesting challenges to ultrasonologists, obstetricians as well as parents due to related issues, economic burden and added need for vigilant antenatal surveillance. Ultrasound has specific role to play in twin pregnancies in the diagnosis of twin pregnancies. Early identification of twin pregnancies and related ultrasound assessment of fetal viability, placentation, status of cervical length and internal os, status of liquor, fetal lie and presentation, fetal lung maturity and other important biophysical profile of fetuses in twin pregnancies help the clinicians to monitor the gestation as well as related maternal and fetal complications which are quite common during such pregnancies as opposed to singleton pregnancy. Serial ultrasound assessment of twin pregnancies is state of art technique in twin pregnancies along with use of non-stress test, color Doppler, serum tests, etc to monitor the gestation vigilantly during entire gravid period after first ultrasound assessment for viability. Monochorionic monoamniotic pregnancy is commonly associated with fetal complications however we found complications of fetuses in monochorionic diamniotic twin pregnancies in our study with three cases of twin -twin transfusion syndromes with relatively less incidence of this anomalous situation in two Indian studies referred to in our article[2, 3]. The outcome of such pregnancies can thus be assessed and treatment modality can be instituted as per indications in the relevant case. Understanding the burden of complications during twin pregnancies helps in planning the future course of treatment and allows for planning of multidisciplinary team of pediatrician, anesthesiologist, neonatologist and gynecologist during delivery of such pregnancies as the case maybe to improve perinatal outcome and avoid fetal loss. LSCS can be planned from the findings gained from ultrasound assessment to avoid perinatal fetal mortality and enhancing chances of fetal survival.

Good antenatal care, increased bed rest, nutritional supplementation, with thorough intranatal and postnatal vigilance can reduce both maternal and fetal complications. Understanding the burden of complications in twin pregnancies helps in planning of health programs wherein compulsory four antenatal ultrasound studies can be suggested for early detection and management of such complications, advising folate supplementation to prevent neurological disorders and educating the uneducated ones the importance of antenatal surveillance by serial ultrasound assessment and other vigilant procedures discussed in length in previous paragraphs.

Table I: - Composite table showing all required variables

Sr No	Age (yrs)	Region	USG findings	Trimester
1	27	Pauri	Monochorionic diamniotic live gestation	2nd
2	25	Tehri	Monochorionic diamniotic live with TTTS	3rd
3	31	RPG	Dichorionic diamniotic live with subch bleed	1st
4	23	Pauri	Monochorionic diamniotic live gestation	3rd
5	26	Pauri	Monochorionic diamniotic live gestation	2nd
6	27	Chamoli	Dichorionic diamniotic live gestation	3rd
7	30	Pauri	Dichorionic diamniotic live gestation	2nd
8	28	Tehri	Monochorionic monoamniotic live gestation	2nd
9	32	RPG	Dichorionic diamniotic live gestation	3rd

10	25	RPG	Monochorionic diamniotic with TTTS & dead stuck twin	3rd
11	23	Pauri	Monochorionic diamniotic live gestation	3rd
12	28	Chamoli	Monochorionic diamniotic live gestation	3rd
13	28	Tehri	Monochorionic diamniotic live with TTTS	2nd
14	34	RPG	Monochorionic diamniotic live gestation	3rd
15	21	Pauri	Dichorionic diamniotic live gestation	3rd
16	25	Pauri	Monochorionic monoamniotic live gestation	3rd

Table II: - Table showing the normal and abnormal twin gestation according to trimester in which they were recognized.

Sr No	Trimester found	No of twin gest.	Normal	Abnormal
1	First	01	----	01
2	Second	05	04	01
3	Third	10	08	02

Table III: - showing age groups showing twin pregnancies.

Sr No	Age group (yrs)	No of cases (n= 16)
1	21- 25	06 (37.5%)
2	26- 30	07(43.8%)
3	31- 35	03(18.8%)

Table IV: showing distribution of cases according to the locality of patients.

Sr No	District	Normal cases	Abnormal cases	Total (n=16)
1	Pauri	07	-----	07
2	Rudraprayag	02	02	04
3	Chamoli	02	-----	02
4	Tehri	01	02	03

Table V: showing types of twin pregnancies encountered in our study.

Sr No	Type of twin pregnancy	No of cases (n=16)
1	Monochorionic monoamniotic	02 (12.5%)
2	Monochorionic diamniotic	09 (56.25%)
3	Dichorionic diamniotic	05 (31.25%)

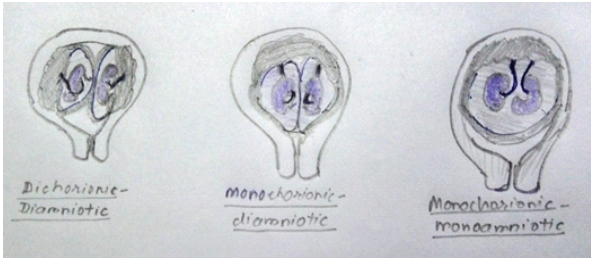

Figure 1:- Illustration is showing various types of twin placentation (gestation/ chorionicity).

Figure 2:- Illustration showing a stuck twin with severe oligohydramnios.

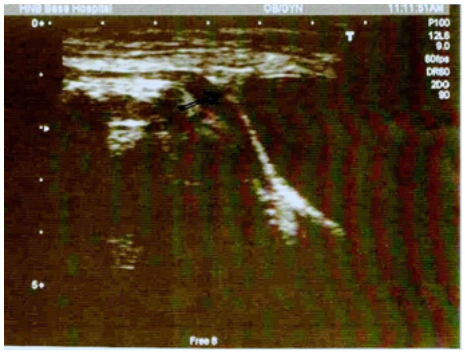

Figure 3:- Dichorionic diamniotic twin pregnancy which had subchorionic bleed (not shown in the image); showing typical 'twin peak' sign or 'lambda sign' on sonography.

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