Scientific Research Publishing

Open Journal of Obstetrics and Gynecology, 2025, 15(12), 1991-1997
https://www.scirp.org/journal/ojog
ISSN Online: 2160-8806
ISSN Print: 2160-8792

Heterokaryotypic Monozygotic Monochorionic Twin Pregnancy: A Case Report of a Rare Occurrence

Janisha Silva Raju*, Ravichandran Jeganathan

Department of Obstetrics & Gynaecology, Hospital Sultanah Aminah, Johor Bahru, Malaysia
Email: janisha82@gmail.com

How to cite this paper: Silva Raju, J. and Jeganathan, R. (2025) Heterokaryotypic Monozygotic Monochorionic Twin Pregnancy: A Case Report of a Rare Occurrence. *Open Journal of Obstetrics and Gynecology*, **15**, 1991-1997.
https://doi.org/10.4236/ojog.2025.1512167

Received: October 23, 2025
Accepted: December 9, 2025
Published: December 12, 2025

Abstract

Heterokaryotype in monozygotic twinning is a rare phenomenon in which the number and appearance of chromosomes differ between the monozygotic pair. Although traditionally, monozygotic pair presumed to be identical, the loss or gain of an entire or part of a chromosome during the cell divisions shortly after fertilization may yield discordant karyotypes. We report a prenatal sonographic finding and the cytogenetic analysis of a monochorionic twin of a spontaneous conception, discordant for severe fetal anomaly. This case emphasizes the clinical relevance of dual cytogenetic sampling in cases of monochorionic twins with discordant sonographic anomalies. Structural abnormalities occur more common in monozygotics compared with dizygotics or singletons. Selective feticide is a treatment option and a favorable outcome of the normal co-twin may be achieved.

Keywords

Heterokaryotypia of Monozygotic Twins, Discordant Monochorionic Twins, Discordant Karyotypes, Cytogenetic Sampling, Selective Feticide

1. Introduction

Heterokaryotypic monozygotic twinning is a rare phenomenon whereby the number and appearance of chromosomes may differ between the monozygotic pair. Monozygotic twins result from fertilization of a single egg by a single sperm and expected to be identical, but rare discordant karyotypes occur due to asymmetric X-chromosome inactivation, unequal gene imprinting, postzygotic mitotic errors including nondisjunction or anaphase lag, or due to spontaneous "rescue" chromosome loss in an initially trisomic zygote [1]-[3].

The common cause hypothesized is nondisjunction of homologous chromosomes [2] [3]. The phase of zygote formation at which nondisjunction occurs determines whether genetic abnormalities occur in both fetuses or only in one fetus. Nondisjunction after the zygote formation is completed may result in one fetus is normal and the other is abnormal [2] [3]. Escalating use of assisted reproductive technology (ART) to achieve pregnancy, also contribute to discordant epigenetic aberrations in monozygotic twins [4].

Here we present the approach to diagnosis, course of pregnancy, management and outcome of this rare case managed in our centre. This article was previously submitted as a poster presentation at the 2024 RCOG World Congress on October 15th to 17th, 2024.

2. Case Description

A 28-year-old, Gravida 2 Para 1, with a spontaneous conception of a monochorionic diamniotic twin pregnancy, referred to our twin clinic. Her husband is 29 years old, the couple have a healthy son and it is a non-consanguineous marriage. They denied of any family history of congenital malformations.

The monochorionicity was determined at 11 weeks of gestation, and discordant sonographic findings were noted since 14 weeks of gestation. Initially, the affected fetus showed nuchal edema by about 14 weeks of gestation (**Figure 1**), which progressed to develop huge septated cystic hygroma. The cystic hygroma gradually increased in size and by 19 weeks it measured 10.3x7.7cm (**Figure 2(A)**), and by 22 weeks it was 16.7 × 10.6 cm (**Figure 2(B)**). The cystic hygroma, as expected, progressed to develop fetal hydrops (**Figure 3**). The co-twin appeared structurally normal on ultrasound.

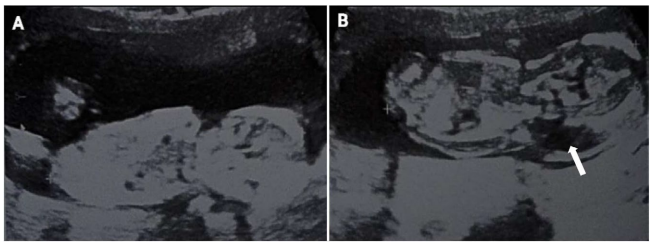

Figure 1. MCDA twins at 14 weeks of gestation. (A) sonographically normal appearing fetus. (B) affected fetus with nuchal edema (white arrow in "B").

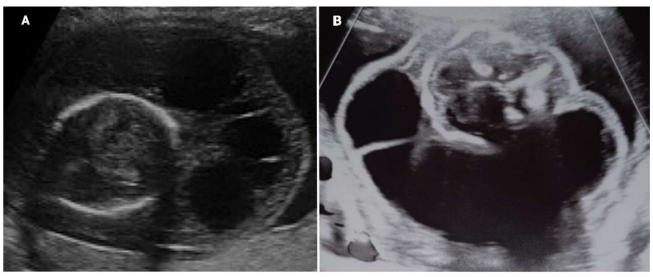

Figure 2. The sonographic features of the fetus with pure Turner, 45,XO. (A) huge septated cystic hygroma at 19 weeks. (B) huge septated cystic hygroma at 22 weeks.

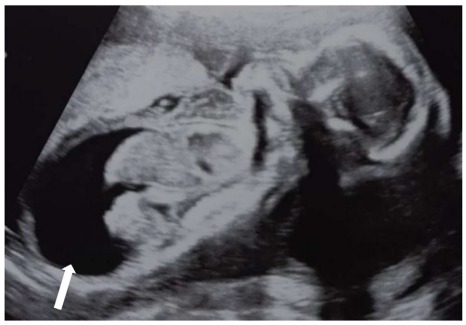

Figure 3. Hydrops fetalis of pure Turner 45,XO with gross ascites (white arrow), pleural effusion and subcutaneous edema.

Amniocentesis done at 17 weeks of gestation revealed karyotypes of 45,XO pure Turner of the abnormal hydropic fetus, whereas the sonographically normal appearing fetus was Variant Turner 46Xdel(X)(p11) (Figure 4). The option of selective fetal reduction discussed but couple opted for conservative management.

Unfortunately, she presented in advanced labor at 23 weeks and aborted both fetuses. The hydropic fetus weighed 1900g and the co-twin was 350g (Figure 5). Monochorionicity of the placenta was ascertained by macroscopic examination post-delivery (Figure 6). Couple were not keen for parental karyotyping nor for genetic counselling by a geneticist.

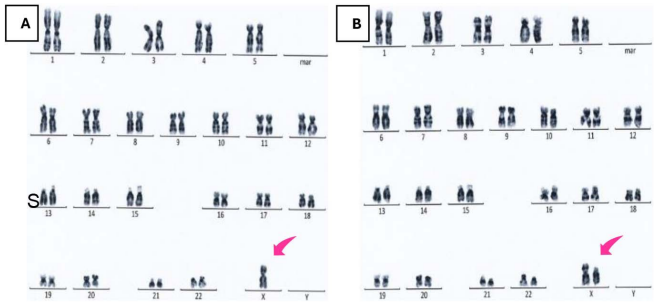

Figure 4. Discordant karyotype of the monozygotic twin: (A) 45,XO pure Turner. (B) 46Xdel(X)(p11) variant Turner.

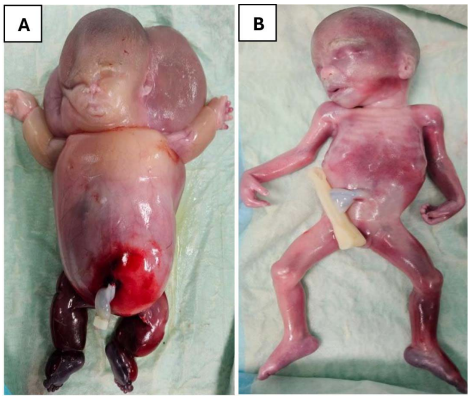

Figure 5. Discordant gross appearance of the monozygotic twin upon delivery. (A) Pure Turner hydropic fetus (birth weight: 1900 g). (B) Variant Turner fetus (birth weight: 350 g).

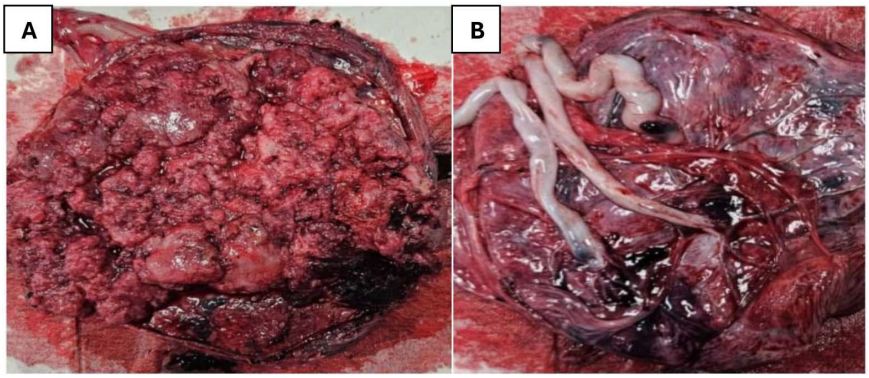

Figure 6. Gross appearance of the placenta. (A) Monochorionic diamniotic (MCDA) placenta (placental weight: 1000 g). (B) Central cord insertion of the hydropic twin and eccentric cord insertion of the variant Turner co-twin.

3. Discussion

Inevitably, monochorionic twin pregnancies may suffer from various complications, including twin-to-twin transfusion syndrome (TTTS), twin-reversed arterial perfusion sequence (TAPS), selective fetal growth restriction (sFGR), conjoined twin, and significant risk for neurological morbidity with increased risk of mortality of the surviving co-twin in case of intrauterine single fetal demise (sIUFD). These complications are attributed to the intertwin vascular anastomoses within the monochorionic placenta.

Literatures have reported that perinatal morbidity and mortality in monochorionic twin pregnancies is significantly higher, whereby it is 3 - 6 times more, than those in dichorionic twin pregnancies [2] [5]. Structural abnormalities occur much common in monozygotic twins compared with dizygotic twins by a relative risk ranging of 1.4 - 2.7 (95% CI, 0.6 - 3.7), whereas compared with singletons, it is also more common by relative risk of 1.25 (95% CI, 1.21 - 1.28) [2]-[5].

Traditionally, monozygotic twins are presumed to be genetically identical. Nevertheless, the term "identical" to describe these twins should be used cautiously, as more reports are emerging on the evidence of discordant genotype and phenotype in monozygotic twins. Monozygotic pairs with discordant genetic makeup are rare, and attributed to multiple potential mechanisms, including asymmetric X-chromosome inactivation, unequal gene imprinting, postzygotic mitotic errors including nondisjunction or anaphase lag, or due to spontaneous "rescue" chromosome loss in an initially trisomic zygote [2] [3]. The possible genetic aberrant responsible in our case is postzygotic mitotic errors, which is likely similar to reports of other heterokaryotypic monozygotic Turner cases [1] [6] [7].

This case highlights the necessity of cytogenetic sampling of both fetuses (dual sac amniocentesis) in cases of monochorionic twins presenting with discordant sonographic anomalies, even in a spontaneous conception. According to reports, CVS and cordocentesis lack tests accuracy [8]. Higher risk of misdiagnosis of discordant aneuploidy been reported with CVS [8], whereas cordocentesis may reveal false result due to intrauterine exchange of lymphocytes through placental

vascular anastomoses between the twins [8] [9]. Indeed, dual sac amniocentesis is crucial for prompt diagnosis of zygosity and cytogenetic analysis, genetic counselling, and timely intervention for selective fetal reduction. Single sac amniocentesis may miss the aneuploidy or genetic aberrant of the co-twin. Nevertheless, there may be some hesitancy for invasive testing, whether CVS or amniocentesis, due to the perceived increased procedure-related risks of pregnancy loss. Offering parental karyotyping may help to rule out parental mosaicism and informs recurrence risk for future pregnancies.

Selective feticide using radiofrequency ablation, fetal interstitial laser or bipolar cord coagulation, is a treatment option in cases of heterokaryotypic monochorionic diamniotic twins, whereby a favorable outcome of the normal co-twin can be achieved [1] [8]. The method of fetal intervention and timing of gestation to perform it, will depend on the severity and potential complications of the anomalous fetus.

Table 1 depicts the few reported cases of various discordant genotype and phenotype among monozygotic pairs.

Table 1. Few reported cases of different genetic discordance in monozygotic pairs.

Genetic Aberration	Literatures
Trisomy 21	Rogers *et al.* [4], Y.L.Chang *et al.* [10]
Trisomy 13	Sepúlveda, Waldo *et al.* [11], Ramsey *et al.* [12], Taylor *et al.* [13]
Trisomy 18	Reuss *et al.* [14]
46, XX with 45, X	Jang *et al.* [1], Gou, Chenyu *et al.* [6], Gilbert *et al.* [7]
46, XY with 45, X	Gonsoulin *et al.* [9], Schmid,O *et al.* [15], Fernández-Martínez *et al.* [16]
47, XXY zygote resulting in 46, XX and 46, XY offspring	Zech, Nicolas H *et al.* [17]
7q34 del; [46, XX, del(7)(q34)]	Rock, K R *et al.* [18]
High-grade mosaic trisomy 18	Gupta *et al.* [2]
Turner - isochromosome X and mosaic isochromosome X	Y. Denkboy Ongen *et al.* [19]
Low-level mosaic trisomy 17	C.P. Chen *et al.* [20]

4. Conclusions

It is inevitable that monochorionic diamniotic pregnancies have notorious complications contributing to adverse pregnancy outcomes. Additionally, heterokaryotypia of monozygotics, although it is rare, should not be missed, as it very much affects the prenatal and postnatal outcome, and is associated with dual fetal loss, like in our case.

Detailed sonographic evaluation, dual sac amniocentesis and zygosity determination are indispensable in diagnosing and managing heterokaryotypia. Selective feticide is an option to improve the survival of the normal co-twin.

This report adds to the limited literature of reported cases and reviews, of spontaneously conceived monochorionic twin pregnancy discordant for genotype and

phenotype.

Acknowledgement

We would like to thank the patient and her spouse for their cooperation and agreement to publish this case.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Jang, J., Kyeong, K., Hong, D.H., Hong, S., Ji, I. and Jeong, E. (2014) A Case Report of Heterokaryotypic Monochorionic Twin Pregnancy with Discordant for Turner Syndrome. *Korean Journal of Perinatology*, **25**, 292-296. https://doi.org/10.14734/kjp.2014.25.4.292

[2] Gupta, A., Aneja, A., Bahl, N., Arora, R., Sehgal, R.R. and Saini, P. (2024) Heterokaryotypic Monochorionic Twin Pregnancy: New Perspective. *Journal of Fetal Medicine*, **11**, 36-42. https://doi.org/10.1055/s-0044-1780493

[3] Machin, G.A. (1996) Some Causes of Genotypic and Phenotypic Discordance in Monozygotic Twin Pairs. *American Journal of Medical Genetics*, **61**, 216-228. https://doi.org/10.1002/(sici)1096-8628(19960122)61:3<216::aid-ajmg5>3.0.co;2-s

[4] Rogers, J.G., Voullaire, L., Gold, H. and Opitz, J.M. (1982) Monozygotic Twins Discordant for Trisomy 21. *American Journal of Medical Genetics*, **11**, 143-146. https://doi.org/10.1002/ajmg.1320110204

[5] Asztalos, E.V., Barrett, J.F.R., Lacy, M. and Luther, M. (2001) Evaluating 2 Year Outcome in Twins ≤ 30 Weeks Gestation at Birth: A Regional Perinatal Unit's Experience. *Twin Research*, **4**, 431-438. https://doi.org/10.1375/1369052012759

[6] Gou, C., Gao, Y., Chen, B. and Fang, Q. (2013) Prenatal Diagnosis and Management of Monozygotic Twins Discordant for Turner Syndrome. *Fetal Diagnosis and Therapy*, **36**, 255-258. https://doi.org/10.1159/000355603

[7] Gilbert, B., Yardin, C., Briault, S., Belin, V., Lienhardt, A., Aubard, Y., *et al.* (2002) Prenatal Diagnosis of Female Monozygotic Twins Discordant for Turner Syndrome: Implications for Prenatal Genetic Counselling. *Prenatal Diagnosis*, **22**, 697-702. https://doi.org/10.1002/pd.383

[8] Lewi, L., Blickstein, I., Van Schoubroeck, D., Gloning, K., Casteels, M., Brandenburg, H., *et al.* (2006) Diagnosis and Management of Heterokaryotypic Monochorionic Twins. *American Journal of Medical Genetics Part A*, **140**, 272-275. https://doi.org/10.1002/ajmg.a.31052

[9] Gonsoulin, W., Copeland, K.L., Carpenter, R.J., Hughes, M.R. and Elder, F.F.B. (1990) Fetal Blood Sampling Demonstrating Chimerism in Monozygotic Twins Discordant for Sex and Tissue Karyotype (46, XY and 45, X). *Prenatal Diagnosis*, **10**, 25-28. https://doi.org/10.1002/pd.1970100105

[10] Chang, Y., Yi, W., Chao, A., Chen, K., Cheng, P., Wang, T., *et al.* (2017) Monozygotic Twins Discordant for Trisomy 21: Discussion of Etiological Events Involved. **56**, 681-685. https://doi.org/10.1016/j.tjog.2017.08.019

[11] Sepulveda, W., Wong, A.E. and Ocaranza, M. (2010) Heterokaryotypic Pregnancy: Monozygotic Monochorionic Twins Discordant for Trisomy 13. *Fetal Diagnosis and Therapy*, **28**, 109-113. https://doi.org/10.1159/000309175

[12] Ramsey, K.W., Slavin, T.P., Graham, G., Hirata, G.I., Balaraman, V. and Seaver, L.H. (2012) Monozygotic Twins Discordant for Trisomy 13. *Journal of Perinatology*, **32**, 306-308. https://doi.org/10.1038/jp.2011.123

[13] Taylor, D.M., Thum, M. and Abdalla, H. (2008) Dichorionic Triamniotic Triplet Pregnancy with Monozygotic Twins Discordant for Trisomy 13 after Preimplantation Genetic Screening: Case Report. *Fertility and Sterility*, **90**, 2017.e5-2017.e9. https://doi.org/10.1016/j.fertnstert.2008.01.095

[14] Reuss, A., Gerlach, H., Bedow, W., Landt, S., Kuhn, U., Stein, A., *et al.* (2011) Monozygotic Twins Discordant for Trisomy 18. *Ultrasound in Obstetrics & Gynecology*, **38**, 727-728. https://doi.org/10.1002/uog.8978

[15] Schmid, O., Trautmann, U., Ashour, H., Ulmer, R., Pfeiffer, R.A. and Beinder, E. (2000) Prenatal Diagnosis of Heterokaryotypic Mosaic Twins Discordant for Fetal Sex. *Prenatal Diagnosis*, **20**, 999-1003. https://doi.org/10.1002/1097-0223(200012)20:12<999::aid-pd948>3.0.co;2-e

[16] Fernández-Martínez, F.J., Galindo, A., Moreno-Izquierdo, A., Gómez-Rodríguez, M.J., Moreno-García, M., Grañeras, A., *et al.* (2007) Application of QF-PCR for the Prenatal Assessment of Discordant Monozygotic Twins for Fetal Sex. *Prenatal Diagnosis*, **27**, 648-652. https://doi.org/10.1002/pd.1746

[17] Zech, N.H., Wisser, J., Natalucci, G., Riegel, M., Baumer, A. and Schinzel, A. (2008) Monochorionic-Diamniotic Twins Discordant in Gender from a Naturally Conceived Pregnancy through Postzygotic Sex Chromosome Loss in a 47, XXY Zygote. *Prenatal Diagnosis*, **28**, 759-763. https://doi.org/10.1002/pd.2031

[18] Rock, K.R., Millard, S., Seravalli, V., McShane, C., Kearney, J., Seitz, E., *et al.* (2017) Discordant Anomalies and Karyotype in a Monochorionic Twin Pregnancy: A Call for Comprehensive Genetic Evaluation. *Ultrasound in Obstetrics & Gynecology*, **49**, 544-545. https://doi.org/10.1002/uog.15985

[19] Ongen, Y. (2024) Heterokaryotic Monozygotic Turner Twins: An Interesting Presentation. *Acta Endocrinologica* (*Bucharest*), **20**, 244-246. https://doi.org/10.4183/aeb.2024.244

[20] Chen, C., Wang, L., Chern, S., Chen, Y., Chen, S., Wu, P., *et al.* (2016) Mosaic Trisomy 17 at Amniocentesis: Prenatal Diagnosis, Molecular Genetic Analysis, and Literature Review. **55**, 712-717. https://doi.org/10.1016/j.tjog.2016.07.006