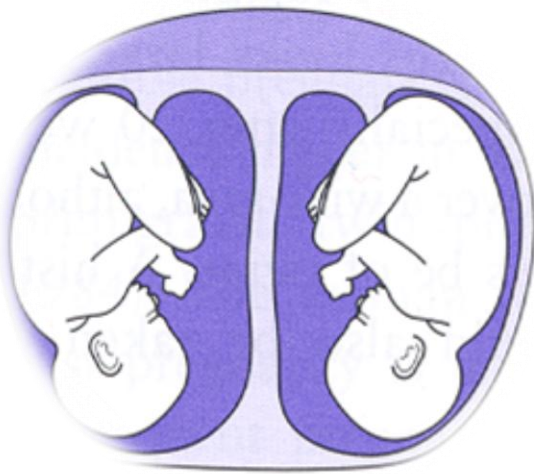


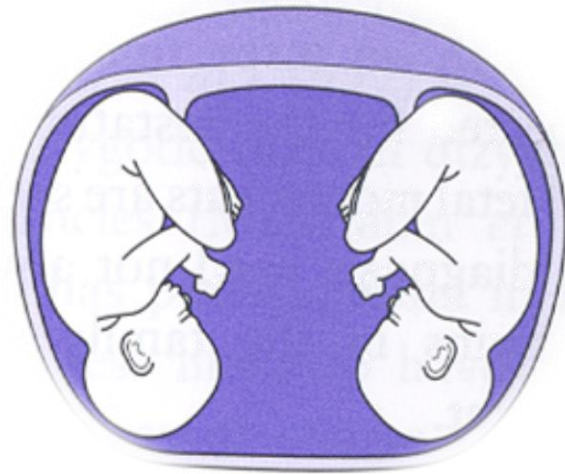
# Monochorionic Multiple Pregnancy and Twin to Twin Transfusion Syndrome

## Introduction

If you are pregnant with more than one baby (twins, triplets or more), the sonographer or physician will look very carefully when you are scanned to see whether each baby has its own placenta (dichorionic) or if they both share one placenta (monochorionic). If there is only one placenta these babies will be monozygotic multiples (MZ, identical). These pregnancies are referred to as Monochorionic (MC) because of the shared placenta and one chorionic membrane surrounding the unborn babies. As you will see from the diagram, both babies are surrounded by one chorionic membrane, and each of the babies may be surrounded by their own amniotic membrane, the inner membrane, or they may share one amniotic membrane.



*Diagram 1* – Single Placenta with 1 chorion and 2 amnions



*Diagram 2* – Single Placenta with 1 chorion and 1 amnion

Please refer to the *Biology of Multiples* Fact Sheet for more details on monozygotic (MZ) multiple pregnancies.

Monochorionic pregnancies are monitored by more frequent scans as there is a chance of developing a condition known as Twin to Twin Transfusion Syndrome which can be serious.

This document will provide you with information about TTTS, one of the most serious of complications for MC multiples including:

- an explanation of what TTTS is
- the cause and frequency of TTTS
- TTTS possible warning signs
- TTTS treatment options
- resources and articles to help you make informed choices and decisions

We also recommend that you read some of our other related fact sheets for more detailed information on multiple pregnancy including *Multiple Births: The Possible Risks: (1) Risks for the Mother, (2) Risks to the Children, and (3) Reducing the Risks.*

***The content of this document is for information purposes only and does not reflect each person's individual situation. If you have any concerns, please contact your health care providers immediately.***

## **Monochorionic Pregnancies**

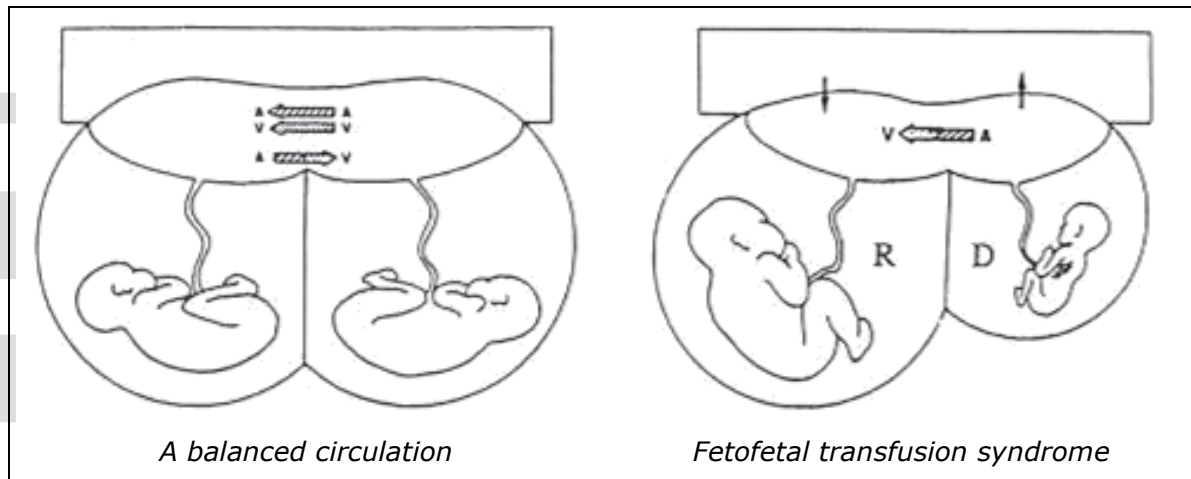
All multiple pregnancies have risks for complications during pregnancy and birth. However, some types of multiple pregnancies have more complications than others. Monozygotic multiples (MZ) who share one placenta (referred to as monochorionic or MC) are at especially high risk for complications such as preterm birth, restricted growth of one or more of the fetuses and Twin to Twin Transfusion Syndrome (TTTS) during pregnancy. If TTTS develops, these unborn multiples require specialized prenatal care and more intensive monitoring than dichorionic multiple pregnancies.

**It is therefore critical to find out by 12-14 weeks of the pregnancy if there is one placenta or two.** Medical specialists will carefully examine the placenta by an ultrasound scan to determine chorionicity and amnionicity. In almost all monochorionic pregnancies the babies have two amniotic or inner membranes so they are each in their own sac. However in about 1-2% of MZ pregnancies, both babies also share the same amniotic membrane. Please refer to the previous diagrams. Prenatal care of the mother and babies is determined by this information.

## **What is TTTS and How Common Is It?**

- About 1/3 of multiples are monozygotic (MZ or identical). Of those, 2/3 share a single placenta and a chorionic membrane, and are thus referred to as monochorionic (MC)
- Twin to twin transfusion syndrome (TTTS) is a disease of the placenta found in MC multiple pregnancies (twins, triplets or more) when two or more babies share a single placenta. The babies have an unbalanced flow of blood and nutrients between them through the blood vessels which connect the circulation of both babies. These are called anastomoses.
- Virtually all MC multiples share blood vessels in their common placenta. However, in many cases the blood flow is shared equally between the two babies so **not all MC multiples will develop TTTS.**
- It is estimated that 10-15% of MC pregnancies are affected by TTTS. However, the actual incidence may be higher because some multiple pregnancies with TTTS may not be reported due to spontaneous miscarriage.
- TTTS can happen at any time in the pregnancy but most commonly at 16-20 weeks. There is no safe zone for TTTS in an MC pregnancy.
- Although the word "twin" is used in *twin-to-twin transfusion syndrome*, TTTS can also occur within in a higher-order multiple pregnancy (triplets or more) when two or more babies share one placenta.
- Approximately 6,000 sets of twins, triplets or more are born each year in Canada; about 260 of these pregnancies are affected by TTTS.

## The effects on the fetus of the shared blood circulation



A = artery  
V = vein  
R = recipient  
D = donor

## What are the complications of TTTS?

If TTTS arises, both babies are affected. It can range in seriousness from mild to severe. The most severe cases develop between 16-26 weeks of pregnancy. TTTS is always potentially life threatening due to the fact that it can worsen at anytime and progress quickly during pregnancy. If untreated TTTS can result in serious complications for the babies and their mother. The following problems can arise:

- One baby (called the donor) does not receive enough blood supply inside the womb, and the other baby (called the recipient) receives too much blood supply.
- The babies have uneven growth due to unequal sharing of the placental blood flow and nutrients. As well, there may be defects of the umbilical cords. The donor baby has slower growth and development. The recipient baby has greater growth and development.
- The donor baby can go into heart failure from severe anemia. The recipient baby can also go into heart failure from an overloaded cardiovascular system.
- The donor baby has less amniotic fluid than the recipient baby.
- The recipient baby has extra amniotic fluid. This is because the recipient baby produces too much urine.
- The mother and babies are at risk of preterm (early) labour which may lead to miscarriage of the entire pregnancy.
- Death of one or more of the babies or neurological damage in the surviving baby(ies).

## What causes TTTS?

- The exact causes of TTTS are not known.
- TTTS is a random act of nature and it is not caused by anything the parents did or did not do. It is neither hereditary nor genetic. It cannot be prevented but with monitoring and early detection, treatment can be offered which is increasingly effective.
- The babies are normal and healthy, but become affected by the problem in their shared placenta with varying levels of severity. TTTS is not something one baby does to the other.

It is all about the placenta and how it distributes blood through the umbilical cords to the babies.

## What are possible signs of TTTS?

- TTTS can appear at any time during the pregnancy. There is no safe zone in an MC pregnancy. The babies are at risk right through the pregnancy including delivery when the cord of the last baby is clamped.
- The later that TTTS presents in the pregnancy, especially if it is less severe, the better the chances for the babies.
- The following list of signs require more thorough investigation by your specialist health care team.

### Possible warning signs in the mother with an MC pregnancy include:

- Sensation of rapid growth of the uterus
- A large-for-dates uterus
- A uterus measurement of 30 cm or more at 16-26 weeks in the pregnancy
- A cervix which is thinning and shortening to 2 cm or less
- Premature contractions
- Shortness of breath
- Sudden weight gain and/or swelling in the mother's body (i.e. hands and legs)

### The following signs of TTTS are looked for in confirmed MC pregnancies:

- Babies growing at different rates
- Too little amniotic fluid around one baby (called Oligohydramnios)
- The presence of too much amniotic fluid around another baby (called Polyhydramnios).
- An enlarged fetal bladder in the recipient and very small or non-visible bladder in the donor
- Difference in the size of the umbilical cords
- Cardiac difficulties in the recipient multiple
- Significant difference in the amount and rate of growth (called Growth Discordance)
- Abnormal results of Doppler ultrasounds of the placental and babies' blood flow and echocardiograms of the fetal heart function.

## What are the treatment options?

It is critical that TTTS be diagnosed and treated as early in the pregnancy as possible. If left untreated, severe TTTS has a death rate of over 80 to almost 100% and can cause severe handicaps for those babies who survive. The good news is that there have been great developments in treating TTTS in recent years but they are complex and each case is individual. Parents of multiples should receive both verbal and written information and counselling about the benefits and risks of the various TTTS treatments to help them make informed decisions and choices.

Treatment options include:

- **Laser therapy** (selective laser photocoagulation, laser ablation) is a specialized surgical procedure in which the placental blood vessels that connect the circulations of the multiples are cauterized with a laser beam to seal shut the shared blood vessels. The normal vessels that help nourish each baby are not touched.

To perform this procedure, the maternal-fetal surgeon inserts a thin fiber-optic instrument (called a fetoscope) through the mother's abdomen, through the wall of the uterus and into the amniotic cavity of the recipient baby. The circulations of the babies are separated so that the fetal circulations no longer mix and transfuse. On successful completion of the procedure, there is no longer sharing of blood between the babies. Laser therapy is not straight forward and involves detailed and complex ultrasounds prior to the procedure. This treatment is generally recommended for TTTS that develops before 26 weeks of the pregnancy, the usual cut-off week for the procedure. Fetal death and preterm delivery are risks following this treatment.

- **Amnioreduction** is a procedure involving the draining of excess amniotic fluid from the sac around the larger baby (recipient baby). In some circumstances the fluid needs to be removed several times (called serial amnioreduction). For severe TTTS cases, experts usually recommend laser therapy over amnioreduction. However in other cases, an amnioreduction may be required in combination with laser surgery. An amnioreduction does not resolve the underlying problem of unbalanced blood flow between the babies.
- **Selective reduction (death) of one twin by closing off blood flow in the umbilical cord** is only considered when one twin is severely compromised, usually the recipient twin, and there is a chance of saving the other twin. This recommendation is based on the knowledge that sacrifice of one twin arrests the syndrome, prolongs the pregnancy and maximizes the outcome for the surviving twin.

## What can expectant parents of multiples do?

- **Make sure that your physician determines the chorionicity of the babies (DC or MC) as early as possible in the pregnancy (by 12-14 weeks gestation) by ultrasound scans.** If they share a placenta, weekly ultrasounds from 16 weeks on are crucial for monitoring for signs of TTTS. If there is uncertainty about the type of chorionicity, referral to a specialist center experienced in high-risk multiple pregnancies should be requested.
- **If it is an MC pregnancy, request an early referral to a maternal-fetal specialist** (a physician who specializes in high risk pregnancies) and other health care professionals who have experience with managing monochorionic multiple pregnancy and births. As well, some larger community hospitals have a specialized multiple-birth clinic in which professionals from various health disciplines provide multiple pregnancy and birth care.
- **Take really good care of yourself and eat healthy.** All women expecting multiples are encouraged to keep well-hydrated and have a balanced healthy diet including protein, calcium, iron, and calcium-rich foods in their daily diet.

# Monochorionic Multiple Pregnancy and Twin to Twin Transfusion Syndrome

- **Bedrest may be prescribed by your health care team.** Bedrest means lying horizontally on the left side, taking breaks on the right side, and getting up only to eat, shower, use the bathroom, and go to appointments. Lying on the left side helps the placenta to function better by increasing blood and oxygen to the placenta and babies and by taking the pressure off of the cervix. Arrange for someone to take on household and childcare responsibilities (if there are older children).
- **Understand what a monochorionic placenta and TTTS is.** Parents should become informed and keep asking questions until you are satisfied and understand the answers.
- **If you have an MC pregnancy and early signs of TTTS appear such as a sudden increase in the size of your uterus, premature contractions or difficulty breathing, ask for a perinatology appointment immediately.** The maternal-fetal medicine specialist will discuss the tests to be performed and the options for treatment. Seek information such as the schedule for tests, the test results and the options for treatment, including risks and benefits.
- **The determination of early stage TTTS should prompt a referral** to a center experienced in the assessment and management of complex MC pregnancies, including the ability to perform laser therapy. As laser therapy for TTTS is only performed in specialized maternity centers, travel may be required.
- **There is tremendous misinformation regarding TTTS** so it is crucial to make decisions based on the most current and accurate information available. There are excellent resources available.
- **Parents need to understand the details of what is happening regarding their babies' growth and health.**
- Refer to The TTTS Foundation website [http://www.ttsfoundation.org/questions\\_explained.php](http://www.ttsfoundation.org/questions_explained.php) for ideas about questions to ask at your weekly ultrasounds.
- **Be proactive and try to remain positive** as you may face many health challenges during the pregnancy. For example, create a medical plan of action with back-up plans so you can be as prepared as possible for each medical appointment. Take along a supportive person who can take notes and advocate on your behalf.
- **Remember: The outlook for the babies improves with early diagnosis of MC pregnancy and TTTS, careful monitoring, skilled treatment, and by following self-care recommendations.**

Every TTTS situation is unique and requires thorough assessment by specialists. Health care professionals are the best source of information regarding each personal situation and can discuss fully how each situation can be managed. However, remember that the ultimate decisions for your children's and your health are yours. If you feel the necessity, get a second, third or even fourth opinion.

## Sources of Information:

Multiple Births Canada

[www.multiplebirthscanada.org/english/higherorder.php](http://www.multiplebirthscanada.org/english/higherorder.php)

Toll-Free (in Canada): 1-866-228-8824

Telephone: 613-834-TWIN(8946)

Email: [office@multiplebirthscanada.org](mailto:office@multiplebirthscanada.org)

Dr. Greg Ryan, Staff Perinatologist

Director, Fetal Medicine Program

Mount Sinai Hospital

Department of Obstetrics and Gynaecology

Division of Maternal-Fetal Medicine

University of Toronto, 3201

700 University Avenue

Toronto ON M5G 1X5

[www.mountsinai.on.ca/care/special-pregnancy-program/spp](http://www.mountsinai.on.ca/care/special-pregnancy-program/spp)

Telephone: 416-586-8403,

Fax: 416-586-3216

Email: [gryan@mtsina.on.ca](mailto:gryan@mtsina.on.ca)

The Twin to Twin Transfusion Syndrome Foundation (USA) - [www.tttsfoundation.org](http://www.tttsfoundation.org)

Email: [info@tttsfoundation.org](mailto:info@tttsfoundation.org)

The Multiple Births Foundation (UK)

[www.multiplebirths.org.uk/](http://www.multiplebirths.org.uk/)

Telephone: 0208 383 3519 Fax: 0208 383 3041

Email: [info@multiplebirths.org.uk](mailto:info@multiplebirths.org.uk)

Graphics used with permission of The Multiple Births Foundation (UK).

One At A Time - [www.oneatotime.org.uk](http://www.oneatotime.org.uk)

International Society for Twin Studies - [www.ists.qimr.edu.au](http://www.ists.qimr.edu.au)

Multiple Births: Prenatal Education & Bereavement Support - [www.multiplebirthsfamilies.com](http://www.multiplebirthsfamilies.com)

Twin2Twin: The UK Twin to Twin Transfusion Syndrome Association - [www.twin2twin.org](http://www.twin2twin.org)

Fetal Care Center of Cincinnati [www.fetalcarecenter.org/conditions/ttts/default.htm](http://www.fetalcarecenter.org/conditions/ttts/default.htm)

UCal- San Fran. videos [http://fetus.ucsfmedicalcenter.org/twin/twin\\_twin\\_transfusion.asp](http://fetus.ucsfmedicalcenter.org/twin/twin_twin_transfusion.asp)

Actual Selective Fetal Laser Photocoagulation video for TTTS Timothy Cromblehome

[www.fetalcarecenter.org/professionals/case-studies/ttts.htm](http://www.fetalcarecenter.org/professionals/case-studies/ttts.htm)

## Documents and Articles:

- Twin to Twin Transfusion Syndrome: A Resource Guide for Parents by Dr. Erika McAslan Fraser (TAMBA) (2011)
- Information for Parents: When Twins Share One Placenta (2010) Multiple Births Foundation. [www.multiplebirths.org.uk/MC%20Pregnancy%20%20Version%2012%2017%205%2010.pdf](http://www.multiplebirths.org.uk/MC%20Pregnancy%20%20Version%2012%2017%205%2010.pdf)
- The TTTS Foundation's 15 Most Important Questions (2011). The TTTS Foundation [www.tttsfoundation.org/index.php](http://www.tttsfoundation.org/index.php)

- Multiple Births Canada Fact Sheets on various topics related to multiple pregnancy, births and parenting [www.multiplebirthscanada.org/english/booklets.php#factsheets](http://www.multiplebirthscanada.org/english/booklets.php#factsheets) including:
  - *Biology of Multiples*
  - *Multiple Births: The Possible Risks – Part 1 Risks for the Mother*
  - *Multiple Births: The Possible Risks – Part 2 Risks to the Children*
  - *Multiple Births: The Possible Risks – Part 3 Reducing the Risks*
  - *Signs and Symptoms of Preterm Labour*

## References:

Bebbington, M. (2010). Twin-to-twin transfusion syndrome: current understanding of pathophysiology, in-utero therapy and impact for future development. *Seminars in Fetal and Neonatal Medicine*, 15 (1), 15-20

Chiossi, G., Quigley, M., Esaka, E., Novic, K., Celebrezze, J., Golde, S., & Thomas, R. (2008). Nutritional supplementation in monochorionic diamniotic twin pregnancies: Impact on Twin-Twin Transfusion Syndrome. *American Journal of Perinatology*, 25 (10), 667-672.

DeFalco, L., Sciscione, A., Megerian, G., Tolosa, J., Macones, G., O’Shea, A., Pollock, M. (2006). Inpatient versus Outpatient Management of Monoamniotic Twins and Outcomes. *American Journal of Perinatology*, 23(4), 205-212.

De Lia, J., Kuhlmann, R., & Mauri, E. (2000). Maternal metabolic abnormalities in twin-to-twin transfusion syndrome at mid-pregnancy. *Twin Research*, 3(2), 113-117.

Habli, M., Lim, F., & Crombleholme, T. (2009) Twin-to-Twin Transfusion Syndrome: A Comprehensive Update. *Clinics in Perinatology* 36 (2), 391-416.

Heyborne K., Porreco R., Garite T., Phair K., Abril D., Obstetrix/Pediatrics Research Study Group (2005). Improved perinatal survival of monoamniotic twins with intensive inpatient monitoring. *American Journal of Obstetrics and Gynecology*, 192(1), 96-101.

Morin, L., & Lim, K. (2011). SOGC Clinical Practice Guideline: Ultrasound in Twin Pregnancies. *Journal Obstetrics and Gynaecology Canada*, 33(6):643-656.

Roqué, H., Gillen-Goldstein, J., Funai, E., Young, B., Lockwood, C. (2003). Perinatal outcomes in monoamniotic gestations. *Journal of Maternal-Fetal and Neonatal Medicine*, 13 (6), 414-42.1

Rossi, A., & D’Addario, V. (2009). Umbilical cord occlusion for selective feticide in complicated monochorionic twins: a systematic review of literature. *American Journal of Obstetrics and Gynecology*, 220 (2), 123-129.

The Royal Australian and New Zealand College of Obstetricians and Gynaecologists  
NEW College Statement Management of Monochorionic Twin Pregnancy C-Obs 42  
March 2011

[Roberts, D.](#), [Gates, S.](#), [Kilby, M.](#), & [Neilson, J.P.](#) (2008). Interventions for twin-twin transfusion syndrome: a Cochrane review. *Ultrasound Obstetrics and Gynecology* 31(6):701-11.

WAPM Consensus Group on Twin-to-Twin Transfusion Syndrome: Baschat, A., Chmait, R., Deprest, J., Grataco, E., Hecher, K., Kontopoulou, E., Quintero, R., Skupski, D., Valsky, D., & Ville, Y. (2011).

Twin-to-twin transfusion syndrome (TTTS): Recommendations and guidelines for perinatal practice. *Journal of Perinatal Medicine* 39 (2), 107-112.

Wilson, R. D., Johnson, A., & Ryan, G. (2009). Current controversies in prenatal diagnosis 2: Should laser ablation of placental anastomoses be used in all cases of twin to twin transfusion? *Prenatal Diagnosis*, 29 (1), 6-10.

## Multiple Births Canada

Donna Launslager, June 2011

### Expert Reviewers:

Jane Denton, Director Multiple Births Foundation, London, England

Linda Leonard, RN, MSN, Vancouver, BC

Dr. Geoff Machin (currently in Victoria, BC) Department of Pathology, Kaiser Medical Center, Oakland, California, USA

Mary Slaman-Forsythe, The Twin to Twin Transfusion Syndrome Foundation, Bay Village, Ohio, USA

### Acknowledgements

Multiple Births Canada would also like to acknowledge the important roles played by the following Multiple Births Canada volunteers:

|               |                |
|---------------|----------------|
| Sheila Catto  | Gail Moore     |
| Lynda Haddon  | Diane Myers    |
| Jenna Kelland | Vicki Riley    |
| Kim Krueger   | Vera Teschow   |
| Erin Little   | Kim Weatherall |

### Questions?

1 (866) 228-8824 (toll free in Canada)

To order copies, contact:

[office@multiplebirthscanada.org](mailto:office@multiplebirthscanada.org)

[www.multiplebirthscanada.org](http://www.multiplebirthscanada.org)

All materials provided by Multiple Births Canada are for **information** only and do not constitute medical advice.

© Copyright Multiple Births Canada 2011

The contents of this publication may not be reproduced or reused in any form, without permission in writing from Multiple Births Canada.

Issued September 2011