

# Sound waves may hold potential to treat twin pregnancy complications

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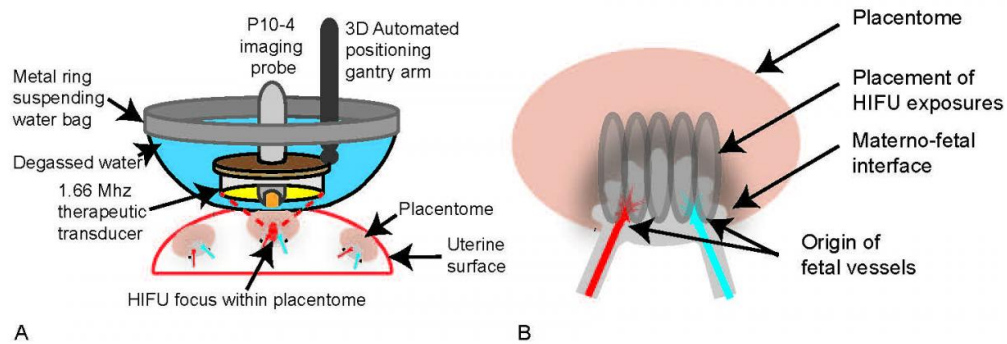


Diagram of side view of equipment setup and high-intensity focused ultrasound (HIFU) exposure placement. (A) Setup of the ring-shaped HIFU transducer and central diagnostic ultrasound probe within a bag of degassed water. (B) Placement of HIFU lesions in a linear track across the origin of the fetal vessels. Credit: Shawi et al. / *Science Translational Medicine* (2016)

High energy sound waves could treat a potentially deadly complication that affects some twin pregnancies, says new research.

The early-stage feasibility study involving sheep suggests High Intensity

Focused Ultrasound - a technique already used for treating some cancers - could help a condition called Twin-Twin Transfusion Syndrome (TTTS). It was conducted by researchers from Imperial College London and the University of Cambridge, with technology being developed at The Institute of Cancer Research, London.

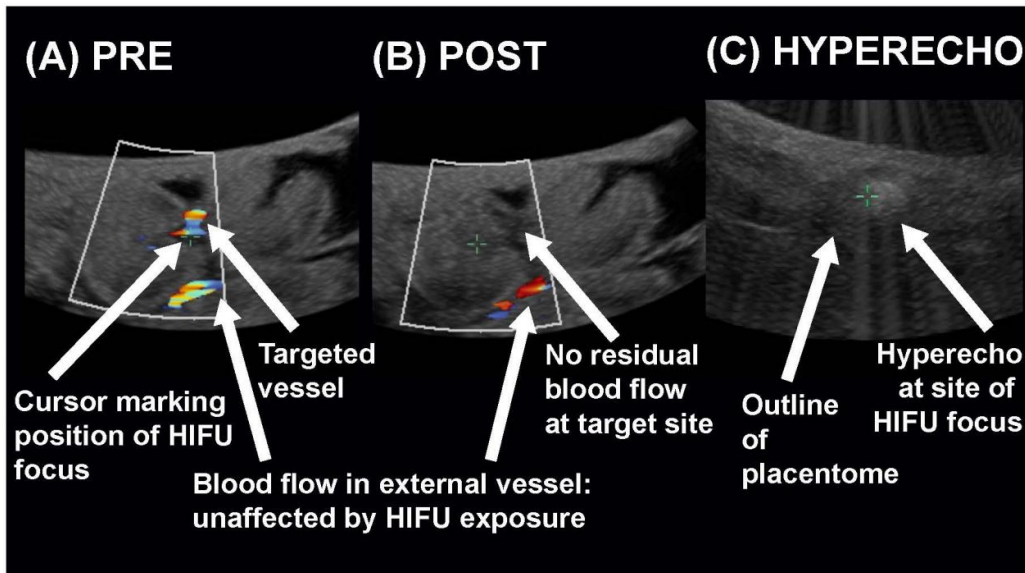
Twin-Twin Transfusion Syndrome occurs in around one in seven identical [twin pregnancies](#), and leads to one baby growing much larger than the other due to [abnormal blood vessels](#) in the placenta.

Some identical twins share a placenta, which provides the babies with equal amounts of oxygen and nutrients, carried in the blood. However in TTTS the shared placenta contains abnormal blood vessels that cause more blood to flow to one baby, leaving the other deprived of oxygen and nutrients.

This affects the twins' growth, and can result in complications such as premature birth, handicap or even death of one or both babies.

Severe cases can be treated by using a laser to destroy the abnormal blood vessels, so that each baby has a separate supply of oxygen and nutrients.

However, this involves making a small hole in the womb and carries a risk of infection or miscarriage, explained Dr Christoph Lees, senior author from the Department of Surgery and Cancer at Imperial: "Twin-Twin Transfusion Syndrome can have tragic consequences, and in severe cases results in one tiny twin, while the other is very large - and begins to squash its sibling in the womb. Unfortunately, the little baby often does very badly - and in some cases the condition results in the loss of both twins.



Color Doppler and B-mode ultrasound imaging of placental vascular ablation. (A) Pretreatment color Doppler imaging of a placentome. (B) Posttreatment color Doppler imaging of the same placentome demonstrating no flow within the targeted vessel. (C) B-mode harmonic ultrasound imaging of hyperechoic region within the high-intensity focused ultrasound (HIFU) focal zone. Credit: Shaw et al. / *Science Translational Medicine* (2016)

"Yet at the moment the only option we have for these serious cases - laser treatment - carries risk of [premature birth](#) or miscarriage. Furthermore, the laser can sometimes not reach some abnormal vessels deep in the placenta."

In the new study, published in the journal *Science Translational Medicine*, the team showed that High Energy Focused Ultrasound (HIFU) can selectively target and destroy placental blood vessels - potentially

enabling it to split the placenta in two without the need for an invasive procedure. The technique creates a beam of [high energy](#) sound waves that generate heat, and kill cells. It is already used to treat prostate cancer and fibroids.

To establish whether the procedure could destroy placental blood vessels, the team used the technique on 11 anaesthetised pregnant sheep - five had the HIFU procedure while six had a placebo procedure.

Although the sheep did not carry twins, the blood vessels in the sheep placenta have a similar structure to blood vessels in the human placenta, enabling the researchers to assess whether the HIFU could separate the placenta in TTTS. Furthermore, the fetuses of sheep and humans are a similar size.

The results showed the technique was successful, and could destroy blood vessels without damage to the fetus. The researchers used the HIFU probe against the wall of the uterus, through an incision in the abdomen - and carried out further experiments to show the procedure works through the skin.

Dr Lees added: "Although this is very early-stage research, it shows the procedure can successfully destroy [blood vessels](#) in the placenta - and could potentially stop abnormal blood flow between twin babies. We now hope to continue developing this HIFU procedure, translate these findings to humans, and work towards human trials."

The team added that because the non-invasive technique could potentially be performed at an earlier stage in the pregnancy, this could further reduce chance of complications. The laser procedure is usually performed at around five months into the pregnancy, once the womb is big enough to accommodate the laser being inserted. However, the current study suggests the procedure may work even earlier, at around

three-four months into the pregnancy.

**More information:** "Noninvasive high-intensity focused ultrasound treatment of twin-twin transfusion syndrome: A preliminary in vivo study," *Science Translational Medicine*, [stm.sciencemag.org/lookup/doi/... scitranslmed.aaf2135](https://stm.sciencemag.org/lookup/doi/10.1126/scitranslmed.aaf2135)

Provided by Imperial College London

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