



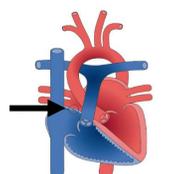
Implementing Cultural Traditions to Treat Congenital Heart Defects



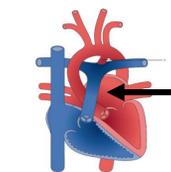
Audrey Alligood, Lynn Chau, Kayla Santos

Congenital Heart Defects

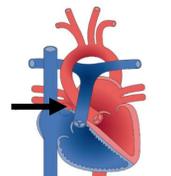
- Congenital heart defects affect an estimated 40,000 births yearly in the United States alone.
- Children who have these defects are at a greater risk of developing severe symptoms in the future such as embolisms, stroke, or even death.
- They manifest as holes within the heart as seen in the figures.
- There are three common ones: Patent foramen ovale(PFO), Patent ductus arteriosus(PDA), and Atrial septal defects(ASD).
- A common trend with these defects is the larger the hole, the more dangerous it is to be left untreated.
- Heart defects are much more severe and frequent for those living at higher altitudes due to low oxygen concentrations and pressure.
- Those that live at higher altitudes commonly have lower birth weights, hypoxemia (lack of oxygen), symptomatic high-altitude pulmonary hypertension (high blood pressure within the respiratory system) and other health problems.
- People who live in these areas also typically have lack of access to healthcare, poor prenatal care, and recurring respiratory infections.



Patent Foramen Ovale(PFO)



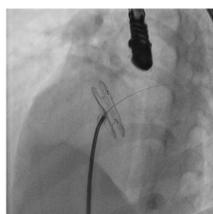
Patent Ductus Arteriosus(PDA)



Atrial Septal Defect(ASD)

Procedure

- The Nit-Occlud application procedure consists of a minimally invasive surgery.
- First, a catheter is inserted into a vessel that directly connects to the defect such as the inferior vena cava or aorta.
- The Nit-Occlud is compressed and pushed through the catheter toward the defect.
- Once there, the surgeon slowly releases the Nit-Occlud in the proper location and it returns to its original shape due to exposure to body temperature.
- After some time, the heart goes through epithelialization, a process where tissue completely grows over the occluder and hole.
- The Nit-Occlud will remain in the patient's heart to provide structure for the new tissue.
- Dr. Freudenthal approximated the procedure to take thirty minutes and the recovery time to be roughly two to three weeks.



Before the catheter is removed.

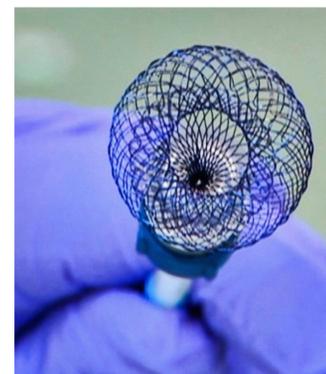


Full release of the Nit-Occlud

The Nit-Occlud

The Nit-Occlud is a medical device used to treat congenital heart defects invented by Dr. Franz Freudenthal. He saw a need within his community of La Paz, Bolivia, to make a cost-effective and safe product to treat the most extreme cases of congenital heart defects. Through his company, PFM SRL, Freudenthal patented several occluders that could treat all sizes of defects. Ever since the Nit-Occlud was patented in 2012, they have helped an estimated 2,500 children in around 60 countries worldwide.

The manufacturing process of the Nit-Occlud occluders is what sets it apart from every other occluder. The Nit-Occlud is hand-woven. The weavers are women from the Aymara people, who are indigenous to La Paz, Bolivia. Their tradition of weaving was repurposed into the creation of highly customizable occluders.

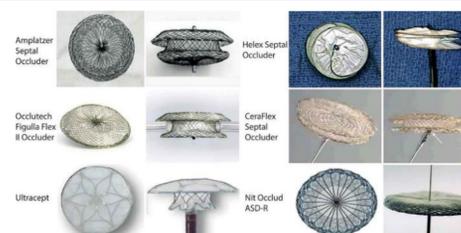


The Nit-Occlud is made of nitinol, a shape-memory, nickel-titanium alloy. It is ideal for use in medicine because it is highly flexible, resistant to kinks and fatigue, as well as extremely biocompatible. However, shape memory is the most important attribute for this application. The shape-memory property of nitinol allows the Nit-Occlud to reform the proper shape once exposed to the internal body heat of the patient. Nitinol is also able to remember its shape. When completely deformed, it is able to restructure itself into its original form.

Potential Success

This weaving system has the potential to expand and be used in other countries. Similar weaving traditions exist in other countries that would find the added income beneficial. Also, a large portion of potential patients with congenital heart defects come from these high altitude locations where open heart surgery is usually the only available treatment. This poses many risks as well as being extremely expensive. Therefore, through the system of Nit-Occlud, these countries could become slightly more self-sufficient and progressive. In addition to benefiting economically from this product, the children and infants affected by these defects could have life saving treatment that will completely heal their congenital heart defects and associated symptoms.

Results of Comparison



- Multiple studies have been conducted about the various occluders from the figure above and how well they work in comparison to the Nit-Occlud.
- The results have found that the Nit-Occlud is the best device in treating congenital heart defects due to the high success rate, minimal reports of complications, and technologically sound design.

Traditions and Community

The indigenous Aymara people of Bolivia have been weaving and knitting intricate patterns for centuries, and the Nit-Occlud gives these people a way to preserve their traditions while receiving a profit for their hard work. The team of weavers consists of forty crafters who went through four months of training to meet sterilization requirements. Dr. John Moore, a director of cardiology at Rady's Children Hospital in San Diego and a leader in a Nit-Occlud study, has coined the term "weaving machines" for these women.



The Nit-Occlud creates a stronger sense of unity within the community. The people are all working together to solve a major issue near their home. This hand weaving program has been successful in Bolivia and can possibly be expanded to other countries at high altitudes with similar weaving traditions in the future. By crafting these handmade occluders, the Aymara people weave together their culture and skills with science in order to treat congenital heart conditions for their own people. The Nit-Occlud is a life-saving device that has been able to simultaneously combine artistic abilities and cultural traditions into a single product.

Sustainability

- Since the Nit-Occlud successful occlusion rate is extremely high; as soon as the procedure has concluded, the patient will no longer need to worry about the defect or symptoms again therefore improving their quality of life.
- No other treatments are required after the procedure aside from a post-op check up.
- Studies have found that the Nit-Occlud is extremely biocompatible due to the nitinol and does not require any replacements.
- There is a very little recovery period from the procedure with an estimation of two to three weeks thereby reducing time and money spent on their procedure.
- The Nit-Occlud has very little waste associated with its production due to how the occluder is made of a single wire.

Sources: <https://www.cdc.gov/ncbddd/heartdefects/data.html>, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4759507/>, <https://www.congenital-heart-disease.ch/heart-disease>, <https://blog.ted.com/healing-hearts-at-the-intersections-of-modern-medicine-and-indigenous-culture/>, <https://www.pfmmedical.com/en/company/unsere-partnerschaften/development-partnerships-in-paediatric-cardiology/index.html>, <https://www.tandfonline.com/doi/full/10.1080/17434440.2016.1182860>, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5017114/>