Title: Tissue engineering replacement grafts for corrective heart surgery using somatic stem cells

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Summary:
In Europe and North America, congenital heart defects (CHD) are the primary cause of infant deaths. The primary treatment for CHD is surgery but the major problem with surgery for such defects is the lack of living replacement materials with the capacity of growth and regeneration. Many children need prosthetic replacement grafts in the form of new valves, conduits and patches, however although these grafts may be life saving, they have limited durability and often require repeat operations in the future. Due to the lack of growth potential of the currently available grafts, a child born with congenital heart defects may typically need to undergo major cardiac surgery several times throughout their lifetime.
We believe that with the use of stem cells we will be able to devise a graft that will grow with the patient, thereby eradicating the need for additional cardiac surgery.
This project investigates the use of perinatal derived stem cells for tissue engineering grafts. Stem cells will be isolated and characterized then seeded onto different scaffolds. The resulting seeded graft will be investigated for morphology changes and vascular cell markers' expression using electron scanning microscopy, immunohistochemistry and RT-realtime PCR. Additionally, the seeded graft will be assessed for biomechanical and contractility properties. The best scaffold will be then used for seeding stem cells in a bioreactor. The resulting engineered graft will be implanted into a preclinical model and its durability, growth potential and suitability to corrective heart surgery will be tested.