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Professor Sir Magdi Yacoub and the Aswan Heart Centre

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Between myectomies, Professor Sir Magdi Yacoub spoke with Amelia Scholtz about the bustling present and promising future of the Aswan Heart Centre.

Professor Sir Magdi Yacoub, OM, FRS, is now a legend in cardiac surgery. He helped initiate a new era of heart transplantation in the United Kingdom in the 1980s and pioneered surgical techniques such as the Ross procedure, the modern arterial switch, and, more recently, a modified Mustard operation. His achievements have been recognized with a British knighthood and numerous honorary degrees.

Long before these successes, Yacoub—with his mother and siblings—spent his early years following his surgeon father around Egypt on a path determined by medical need and government imperatives. Among the many places in which the family lived, the Upper Egypt city of Aswan holds special significance. Yacoub affectionately recalls the natural beauty of the city and the cultural diversity that he witnessed on its streets as a child (**Figure 1**). He was reminded of Aswan a decade or so later when, as a young doctor, he saw patients from the city in his work at Cairo University Hospital. "Children coming from that area … arrived to Cairo in a very sorry state. They were dehydrated. They were infected. They were dying. This was a very badly neglected area, particularly when it came to pediatric cardiology or cardiac surgery," he recalled, adding, "of the entire Upper Egypt, particularly right at the end, Aswan was a neglected area."

Over the subsequent years, Yacoub became increasingly concerned with care delivery, hoping to leave a more lasting legacy than what he terms "surgical tourism." "The idea of going to do a few operations or offering medicine without consistency is just useless," he opines. An underserved city with 1.5 million residents, Aswan was a natural choice for a cardiac research and treatment facility that would realize Yacoub's dream of more lasting, widespread improvements for cardiovascular health in Egypt. He established the Aswan Heart Centre (AHC) in 2009 as a project of Chain of Hope, a charity also founded by Yacoub. With a continuing stream of donations from Egyptians rich and poor, as well as partnerships with universities and health care organizations around the world, the AHC is now a tertiary referral center serving patients not only from the Aswan region, but also from other parts of Egypt and Africa. In addition to its 96 patient beds, 2 operating rooms, intensive care facilities, cardiac catheterization laboratories, patient examination rooms, advanced imaging facility, and 100-seat auditorium, the Centre houses life sciences and biomedical engineering laboratories (**Figures 2 and 3**).

Each year, AHC clinicians perform approximately 1,100 open-heart operations and 3,000 cardiac catheterizations, with approximately 25,000 consultations taking place in outpatient clinics. The AHC's primary percutaneous coronary intervention service is the only program of its kind within a 250-mile radius and serves a population of 2,000,000. Additionally, the Centre runs one of the largest chronic total occlusion programs in the region and a transcatheter valve therapy service. Perhaps surprisingly, 60% of surgical patients are children. Two factors account for the preponderance of children in the surgical caseload. First, high levels of consanguinity in the Egyptian population make for high rates of congenital heart disease (CHD), including hypertrophic cardiomyopathy (HCM) and transposition of the great arteries (TGA). A second factor—the poverty of the region and related inadequacies in public health—both exacerbates congenital disease and increases rates of acquired disease (e.g., pulmonary hypertension and rheumatic heart disease [RHD]). Yacoub is

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FIGURE 1 Scenery in Aswan

particularly troubled by "a lack of preventive measures" in Egypt, with insufficient action to curb high rates of tobacco use and pollution. The interplay between poverty and consanguinity is most apparent in cases of TGA, where a lack of medical care in the region means that many patients present with neglected disease. Yacoub explains, "We've been trying to revive the Mustard operation and modify it in order to treat patients who are not suitable for neonatal switch and who have severe pulmonary hypertension and other comorbidities."

As with all of the AHC's clinical efforts, work on TGA and CHD more generally is matched with a robust research program (**Figure 4**). The AHC has established a comprehensive database of CHD in Egypt, with a focus on obtaining detailed phenotypic data. In addition, the Aswan Congenital Registry is being used to identify the genetic bases of CHD among Egyptians using data from patients and their families. Innovations in CHD also are occurring in the operating room, where surgeons are working to optimize operative techniques in both neonates and neglected cases. With regard to TGA specifically, Yacoub and colleagues have presented their modified Mustard operation in a 2017 editorial comment in the *Journal* and in a poster documenting midterm outcomes at the 2018 American College of Cardiology Scientific Sessions (1,2). In a series of 55 patients age 6 months to 10 years, "all patients derived considerable improvement in their exercise capacity and general condition" from the operation (2).

As with neglected cases of TGA, poverty accounts for the prevalence of RHD, which contributes directly to "25% to 30% of our workload," Yacoub explains. "This is a disaster in the making that has to be confronted, not only at the clinical level but at the research level." With regard to the former, AHC focuses on using and developing techniques for valve repair rather than replacement, because of the

FIGURE 2 Intensive Care Unit at the Aswan Heart Centre