

## The practice of heart-beating coronary revascularization as a high-performance sport

*La práctica de la revascularización coronaria a corazón latiendo como un deporte de alto rendimiento*

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### Key words:

Coronary revascularization, beating heart, high-performance sport, surgeon, athlete.

### Palabras clave:

Revascularización coronaria, corazón latiendo, deporte de alto rendimiento, cirujano, atleta.

### ABSTRACT

It is required to be a certified cardiac surgeon, perform traditional ischemic revascularization (with circulatory support) in a formal cardiac center, and a gradual and progressive incursion into heart-beating surgery, but why is the practice of this technique like high-performance sports? The high-performance athlete—as the surgeon—requires training and a lot of time of constant, systematic, and safe practice. You need to progress in different levels of evolutionary practice by objectives, as well as very high doses of intrinsic motivation, because you face detractors within the same working group (surgeons, anesthesiologists and cardiologists). Constant, persistent and systematic daily practice leads to mastery of the technique with different levels of ascending progression.

### RESUMEN

*Se requiere ser un cirujano cardíaco certificado, practicar revascularización isquémica tradicional (con soporte circulatorio) en un cardiocentro formal e incursionar paulatina y progresivamente en la cirugía a corazón latiendo, pero ¿por qué la práctica de esta técnica es como los deportes de alto rendimiento? El atleta de alto rendimiento—como el cirujano—requiere de entrenamiento y mucho tiempo de práctica constante, sistemática y segura. Es preciso progresar en distintos niveles de práctica evolutiva por objetivos y es muy importante tener una dosis alta de motivación intrínseca, porque te enfrentas a detractores dentro del mismo grupo de trabajo (cirujanos, anestesiólogos y cardiólogos). Con la práctica diaria, constante, persistente y sistemática se llega al dominio de la técnica con distintos niveles de progresión ascendente.*

This paper is an opinion on the daily practice of off-pump coronary revascularization at the Department of Cardiovascular Surgery of the *Hospital Central Sur de Alta Especialidad de Petróleos Mexicanos*. Compared to other hospitals in Mexico, this hospital has been at the forefront in this type of surgery for the past 10 years, with an average of 150 surgeries per year in patients with ischemic heart disease. Taking into account the aging of the population and an increase in comorbidities, we forego aortic clamping which has led to fewer complications, such as systemic inflammatory response and clotting disorders, the need for blood transfusions, infections, morbidity, and mortality.<sup>1-7</sup>

The benefits that off-pump coronary revascularization offers to patients are undeniable. This procedure is becoming more accepted worldwide and involves less

risk and complications than surgery with extracorporeal circulation.<sup>2,8</sup> The history and progress of heart surgery have faced resistance to change and to the adoption of better tools for the treatment of ischemic heart disease. Over the past twenty years, this technique has been “rescued”. Off-pump heart surgery dates back to 1964 and was pioneered by Russian surgeon Vasilii Kolesov, who was born on September 24, 1904 in a small town in the Vologda region, and died in Saint Petersburg on August 2, 1992. In the mid-50’s, he learned about the so-called “Demikhov experiment”, which consisted in performing a termino-lateral anastomosis of the internal mammary artery to the coronary arteries of dogs. In 1963, he developed a cannula to maintain blood flow through the coronary artery while performing the anastomoses, an experiment he carried out in eight dogs with

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no disruption of coronary flow, and he even demonstrated patency of the anastomoses 19 months later. On February 25, 1964, he operated on a woman with angina through a left thoracotomy. With the heart in motion, he performed the anastomosis of the left internal mammary artery to the circumflex coronary artery, thus leading to relief of the angina.<sup>9-12</sup>

At the time, knowledge of heart physiology and extracorporeal circulation was limited, as a consequence of World War II. The idea of extracorporeal circulation was conceived by Dr. John H. Gibbon around 1931. After witnessing the death of a patient from pulmonary embolism, he thought that, if there could be a machine that oxygenated blood and returned it to the patient's arterial circulation, injury could be reverted. He worked on the idea for nine years, from 1934 through 1942. It was not until 1950 that IBM supported him to build a heart-lung machine. Eventually, on May 6, 1953, Dr. Gibbon closed an atrial septal defect in an 18-year-old woman, successfully using the heart-lung machine.<sup>8,10,13</sup>

Currently, beating heart coronary revascularization is commonplace in various heart surgical centers throughout the world; as a matter of fact, from a teaching point view, these centers emphasize the needs of trainees by allotting which and how many patients they must operate on in order to master this surgical technique.<sup>6,7,14,15</sup> This is not considered thus in our country, but the trainee must be a certified heart surgeon, practice the traditional ischemic revascularization technique in a formal heart center and slowly progress into the realm of beating heart surgery. But, how is this technique similar to high-performance sports? Like a surgeon, a high-performance athlete requires training and a long time of dedicated, methodical and safe practice.<sup>16</sup> He or she must advance through several levels of goal-oriented, progressive practice and, most importantly, possess high levels of intrinsic motivation, because detractors are found even within the same team —surgeons, anesthesiologists and cardiologists. With daily, continuous, persistent, and methodical practice, the technique can be mastered at different levels of escalating progression. “Perhaps” after 50 off-pump revascularization procedures to become

confident and 5 years of constant practice can the surgeon “consider himself” an expert in beating heart surgery and only then, will he “have mastered the art”.

The surgeon must consider himself or do all in his power to consider himself a high-performance athlete. The athlete practices daily to become speedier, faster and stronger. To perfect his skills, the surgeon should also operate daily, if possible at his center, or at least every other day; read on his specialty; follow a sound diet; and possess full physical and mental capabilities. Being an active heart surgeon requires health in all aspects, resistance, and physical and mental strength; he must practice a sport, show emotional balance, great tolerance to frustration and high resilience, because even in the path of the expert, patients are lost.

The skills necessary to perform off-pump revascularization are different than those required for operating on a “still” heart.<sup>3,7,14</sup> Mental disposition and the ability to execute lead to the release of adrenaline, but without risking the patient's safety, and with drugs, monitoring and perfusion at the ready. There is a significant difference with traditional bypass, because the anastomoses have to be performed on a moving segment of the coronary vessel, in a counter-clockwise direction, and generally starting with the anastomosis of the anterior descending coronary artery, then the right system, and finally the circumflex artery and its branches. For each anastomosis, the heart must be repositioned and the operating table is shifted, with various combinations of thorax positions; there are moments when the heart is literally vertical, and the power and complexity of each heartbeat can be felt. At this step of optimal repositioning and stabilization, hemodynamic consequences may be immediately observed in the heart, in monitors, even in the various expressions and looks of the assistant and the anesthesiologist. During these moments, regional ischemia and its effects may cause local or systemic consequences leading to arrhythmias.

In order to practice a sport, the athlete requires an unsophisticated indoors or outdoors track or field, whereas the surgeon depends on the operating room provided by the

institution, with all the physical, technical and pharmaceutical means that ensure the patient's safety. Chromosome 11 —by the way, the longest one in human beings— is related to the limbic system and the brain cortex. “Strong” emotions and pleasant sensations in humans are located or arise in these structures. Perhaps this information is coded in us surgeons, and having a certain version of this gene predisposes us to practice high “risk” or “performance” sports, which is why some of us are surgeons and some are not. Among surgeons, the soundest path is to become relentless and persistent emotion seekers and adrenaline addicts, but aimed at further exploring and discovering more and better tools for the benefit of our patients, those we have operated on, and those to come.

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