Sudden Death in Athletes

Sudden deaths in athletes caused by cardiac arrest are not a recent occurrence. In 490 BC, Phidippides, a young Greek messenger, ran 26.2 miles from Marathon to Athens delivering the news of the Greek victory over the Persians, and then he collapsed and died. This is probably the first recorded incident of sudden death of an athlete. The death of young athlete is always dramatic and tragic and has the potential of devastating families, friends and communities.

Worldwide sudden death occurs in 1 to 2 in 200,000 athletes annually and predominately strikes male athletes. In the United States of America football (American) and basketball account for two-thirds of sudden deaths of athletes. There are no global statistics setting out the number of sudden cardiac failures among footballers, although for sport in general there are an estimated 1000 deaths a year from such cases.

A recent case of cardiac arrest that comes to mind is that of Fabrice Muamba, the 23-year-old professional soccer player in Britain who collapsed during a game in March 2012 after suffering cardiac arrest. He survived thanks to the prompt and timely management that he received, both on the pitch and in hospital.

Unfortunately there had been several such cases in the past. On 28th of August 2007, 22 year old Antonio Jose Puerta Perez, who played football for the Spanish team Sevilla died three days after suffering a series of cardiac arrests during a league game against Getafe on the 25th of August 2007.

After the event Mr. Puerta's club stressed that the entire squad had undergone exhaustive pre-season fitness and health tests without anything showing up during Mr Puerta's examinations.

On the day that Antonio Puerta died the Carling Cup tie between Leicester City and Nottingham Forest was abandoned at half time after Leicester defender Clive Clarke collapsed in the changing room at half time. Paramedics rushed down the tunnel to attend to the 27-year-old and successfully revived the heart using a defibrillator before taking him to Queens Medical Centre in Nottingham, where a genetic condition known as Long QT Syndrome was discovered as the cause of the cardiac arrest.

The day after Mr Puerta's collapse, another soccer player, this time from Zambia, 27 year old Chaswe Nsowfa, collapsed during a training session with the Israeli side in which he played. He later died in hospital.

Also in August, 2007, precisely on the 20th, a 16 year old trainee at England's Walsall, Anton Reid, died in similar circumstances. He slumped to the ground at the University of Aston Training Ground, in Walsall. On-site medical staff, paramedics and doctors all battled unsuccessfully to revive him.

America also has a history of some well-known athletes who were victims of sudden death. The list include marathon runner Jim Fixx (1984), Olympic volleyball star Flo Hyman (1986), NBA basketball star

Heart attack risks are greater for athletes who compete in endurance sports, especially endurance athletes who exercise for three hours or more.

One such endurance sport is the Ironman Triathlon, which is one of a series of long-distance triathlon races organized by the World Triathlon Corporation (WTC) consisting of a 3.86 km swim, a 180.25 km bike and a marathon 42.2 km run, raced in that order and without a break.

It is said that marathon runners, and long-distance cyclists, swimmers, rowers and cross-country skiers are all in the same boat as ironman triathletes. Any athlete who participates in a strenuous test of endurance lasting about three hours or more has an increased chance of dying during - and for 24 hours following - the exertion.

To find out why strenuous exercise temporarily increases the risk of death, researchers at the University of Innsbruck in Austria studied 38 male participants in the 1999 Tyrolean Otztaler Radmarathon, a cycling race which covers 230 km, with an altitude change of 5,500m. This particular cycling race is often said to be comparable in difficulty to the hardest mountain stages of the Tour de France (2).

All 38 subjects were experienced, well-trained amateur cyclists who were free of cardiovascular risk factors and without evidence of heart disease. The Austrian researchers monitored the blood levels of a specific heart enzyme called cardiac troponin I, which happens to be the most sensitive and specific marker for the detection of heart-muscle death. Cardiac troponin I values, which were essentially at zero in all athletes before the beginning of the increased in 13 (34%) of the cyclists immediately after the competition. Particularly at risk to heart muscle damage were younger, fitter athletes, who put more stress on their hearts through greater training volume and higher racing intensities.

The Austrian researchers postulate that many of the well-trained athletes probably experienced sub-clinical cardiac injury during the event and this was associated with the actual deaths of heart-muscle cells. The mechanism underlying such cardiac cell deaths may be due to heightened release of the stress hormones adrenaline/nor-adrenaline during prolonged exercise which leads to the constriction of coronary arteries, which results in localized cell death within the heart.
Causes of Cardiac Arrest

**Hypertrophic Obstructive Cardiomyopathy:**
This is a congenital disorder in which there is an excessive thickening of the heart muscle at the apex of the heart. This condition can lead to an irregular heart rhythm called ventricular fibrillation, during which numerous chaotic electrical discharges go to the chambers of the heart resulting in quivering of the heart with no blood effectively being pumped into the body. This abnormality usually produces no symptoms and is disproportionately prevalent in Africans and people of African descent such as African-American.

**Abnormal coronary arteries:**
This is said to be the second most common cause of sudden death in athletes is abnormal coronary arteries. These are the blood vessels that supply oxygen to the heart muscle. Often, coronary arteries originate from an abnormal that makes the artery forms a sharp angle that can "kink" during strenuous exercise, when there is more stress on the vascular system. The kinking can cut off the flow of blood to the heart muscle, which then can produce fatal cardiac arrhythmias and sudden death.

**Electrical conduction abnormalities of the heart**
Some cases of sudden cardiac arrest are due to a handful of genetically inherited heart rhythm disorders:

- **Long QT Syndrome:** is a congenital disorder characterized by a prolongation of the QT interval on electrocardiograms (ECGs) and a propensity to ventricular tachyarrhythmias, which may lead to
syncope, cardiac arrest, or sudden death.

- **Brugada Syndrome**: named after the Spanish cardiologists Pedro Brugada and Josep Brugada it is a genetic disorder that is characterized by typical ECG abnormalities ST segment elevation in the precordial leads (V1 - V3). It is the major cause of sudden unexplained death syndrome (SUDS). Death results from ventricular fibrillation. Brugada syndrome is the most common cause of sudden death in young men without known underlying cardiac disease in Thailand and Laos.

- **Arrhythmogenic Right Ventricular Cardiomyopathy (ARVC)**. The disease is a type of nonischemic cardiomyopathy that involves primarily the right ventricle. It is characterized by hypokinetic areas involving the free wall of the right ventricle, with fibrofatty replacement of the right ventricular myocardium, with associated arrhythmias originating in the right ventricle. The Spanish player Antonio Puerta was found to have this disease.

- **Catecholaminergic Polymorphic Ventricular Tachycardia (CPVT)**: is an inherited cardiac disorder in which the heart cells are electrically unstable when under stress and are prone to developing an abnormally fast and dangerous heart rhythm called "Ventricular Tachycardia" (VT). Catecholaminergic refers to the fact that the dangerous arrhythmias are initiated at times of emotional stress or physical activity, when the nervous system uses the natural stress hormones adrenaline and nor-adrenaline to stimulate physical performance. Unfortunately, due to the altered cellular mechanisms in the heart, this initiates a specific type of VT that is polymorphic—meaning that it comes from multiple locations in the heart’s conduction system, rather than the usual pace making cells. This disorder is often difficult to diagnose, due to the fact that the heart is structurally normal and the electrocardiogram (EKG) is also usually normal at rest.

Other causes of sudden death among athletes include the following:

- **Marfan syndrome**: This syndrome affects approximately 1 in 20,000 of the general population. People who have this medical condition are usually tall, slender, and loose-jointed. It is a hereditary disorder of the connective tissue, which is the basic substance that holds blood vessels, heart valves, and other structures together. Olympic volleyball star Flo Hyman who died suddenly in 1986 had Marfan syndrome. On June 8, 2004, Florida State basketball player Ronalda Pierce died from an aorta rupture that was a result of this syndrome.
Non-cardiac causes
A blow to the chest in the area of the heart, called commotio cordis, or cardiac concussion is the most common cause of sudden death in athletes who have no heart abnormality. This condition often occurs in children or adolescents with a non-penetrating and usually innocent appearing blow to the middle of the chest, such as when a baseball, hockey puck, softball, or karate blow strikes the athlete's chest.

Screening
High school and university athletes must have a physical examination by a physician before participating in organized sports. Athletes with a family history of sudden death, Marfan syndrome, or heart disease at a young age, a history of exercise-induced syncope (fainting), a loud heart murmur, or previous heart surgery require further evaluation by a cardiologist. It must be said, though, that pre-participation sports history and physical examination are often not sensitive enough to pick up rare heart conditions. Screening probably does identify 3% to 15% of athletes at risk.

Signs and symptoms
Chest pain, syncope (fainting), dizziness, palpitations (sensation of a rapid or irregular heart beat), fatigue, and excessive or prolonged shortness of breath can be innocent sensations that can accompany intense exercise. Nevertheless, they should be evaluated by a physician because they could be a sign of a heart or lung disorder.

Although sudden death in athletes is devastating, it is very rare and the benefits of exercise for all ages are recognized by improved lipid levels, glucose (sugar) tolerance, enhanced self-assurance, and improved overall quality of life. There are many things that can be done to help prevent exertion related illness or death. Exercise should be done in the morning or evening, not in the afternoon. It is important to take plenty of fluids, and avoid alcohol and caffeinated beverages. Individuals with a family history of heart disease, stroke, or sudden death and those over the age of 30 years should consult their doctors before embarking on regular exercises. Smoking, use of anabolic steroids and stimulants should be avoided and any chest pain, fainting, dizziness, unusually rapid heartbeat, fatigue, and excessive or prolonged shortness of breath should be reported to the doctor.

Precaution
At all sporting events there should be health workers who are trained in Cardiopulmonary Resuscitation (CPR) and above all can use a defibrillator to abort dangerously abnormal heart rhythms. Resuscitation should begin immediately and continued till the victim gets to the hospital.