بسم الله الرحمن الرحيم

MONA MAGHRABY

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

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INTRODUCTION

Although there has been a major reduction in mortality rates from cardiovascular diseases (CVD) especially coronary artery diseases globally, still they remain the number one cause of death. More people die annually from CVDs than from any other cause. An estimated 17.9 million people died from CVDs in 2016, representing 31% of all global deaths. Of these deaths, an estimated 7.4 million were due to coronary artery disease and 6.7 million were due to stroke ***(Global Health Estimates 2016).***

CTOs in the most recent registries showed a prevalence between 16 and 20% among all patients presented with IHD to the cath. Lab. ***(Azzalini et al., 2016).***

CTOs are defined as coronary obstructions which produce total occlusion of vessel lumen with thrombolysis in myocardial infarction (TIMI 0) flow of a duration longer than Three months ***(Carline et al., 2015)*** while occlusions with the minimal passage of contrast without opacification of the distal vessel are considered "functional CTO" ***(Jeroudi et al., 2014).***

Multiple scoring systems have been created to predict CTO PCI technical success, efficiency, and complications, the first and most widely used score was created by investigators from the J-CTO registry (Multicenter CTO Registry in Japan) and included only angiographic parameters that combined 5

baseline clinical and angiographic CTO parameters into a 5-point scoring system (Japan CTO / J-CTO score). One point is given for each of the following factors that were associated with a lower probability of successful guide wire crossing within 30 minutes: blunt stump, calcification, within lesion bending more than 45 degrees, occlusion length more than 20mm, and prior failed attempt to revascularize the CTO ***(Morino et al., 2011).***

Easy (J-CTO=0), Intermediate (J-CTO=1), Difficult (J-CTO=2), Very difficult (J-CTO≥3).

Technical success is defined as the ability to cross the occluded segment with both a wire and a balloon, and successfully open the artery; the restoration of antegrade TIMI flow 2 or 3 and a less than 30% residual stenosis ***(Takimura et al., 2012).***

Procedural success of chronic total occlusion PCI is defined as achievement of technical successful CTO revascularization with achievement of less than 30% residual diameter stenosis within the treated segment and restoration of antegrade TIMI grade 2 or 3 flow with no in-hospital major adverse cardiac events (MACE) during the hospital stay before discharge ***(Rolt et al., 2013).***

MACE includes any of the following adverse events before hospital discharge (death from any cause, Q-wave myocardial infarction, urgent repeat target vessel

revascularization with PCI or coronary bypass surgery, tamponade requiring pericardiocentesis, surgery, or stroke) ***(Mehran et al., 2011).***

Percutaneous coronary intervention in chronic total occlusion (PCI CTO) is a rapidly evolving field, is considered the last frontier of interventional cardiology. In recent years, the development of new techniques and equipment, as well as the training of specialized personnel, increased their success rates, Although the number of randomized and controlled studies is still limited, results from large multicenter registries allow us to safely offer this intervention to patients, as another treatment options along with the optimized drug treatment and myocardial revascularization surgery ***(Ybarra et al., 2018).***

Aim of the Work

The aim of this registry was to develop an electronic registry for all patients who had Percutaneous coronary intervention (PCI) of chronic total occlusions (CTOs) at Ain Shams University Hospitals (ASUHs) over a period of eight months. To collect data about CTO treatment strategies aiming to analyze the potential risk factors and their effect on the different treatment strategies and to predict the outcomes regarding technical and procedural success during the hospital stay.

Chapter (1)

ATHEROSCLEROSIS AND PERCUTANEOUS CORONARY INTERVENTION

Atherosclerosis

Atherosclerosis involves multiple interconnected processes including lipid disturbances, vascular smooth muscle cell activation, inflammation, altered matrix metabolism, oxidative stress, cell apoptosis, and remodeling ***(Faxon et al., 2004).***

This process has been well described by Ross et al., starting with the accumulation of lipid-laden macrophages, beneath the endothelium resulting in a fatty streak ***(Parsons et al., 2018).***

The lesions expand, and more smooth muscle cells, inflammatory cell infiltrate, and extracellular matrix accumulates, surrounding the core of extracellular lipid and foam cells ***(Faxon et al., 2004).***

Many of the involved immune cells are activated and produce inflammatory cytokines ***(Wal & Becker, 1994).***

As the plaque matures and expands, it acquires fragile microvasculature (vasa vasorum), which may bleed and further fuel atherosclerotic progression ***(Srivatsa et al., 1997).***

Inflammation is ongoing and biomarkers such as elevated C-reactive protein (CRP) on sensitive immunoassays predict coronary heart disease ***(Eiriksdottir et al., 2004).***

Percutaneous coronary intervention

Percutaneous coronary intervention (PCI), commonly known as coronary angioplasty or simply angioplasty, is a non-surgical procedure used to treat the stenotic (narrowed) coronary arteries of the heart found in coronary heart disease. These stenotic segments are due to the buildup of the cholesterol-laden plaques that form due to atherosclerosis. PCI is usually performed by an interventional cardiologist ***(Palmerini et al., 2012).***

During PCI, a cardiologist feeds a deflated balloon or other devices on a catheter from the inguinal femoral artery or radial artery up through blood vessels until they reach the site of blockage in the heart. X-ray imaging is used to guide the catheter threading. At the blockage, the balloon is inflated to open the artery, allowing blood to flow. A stent is often placed at the site of blockage to permanently open the artery ***(Stroupe et al., 2006).***

Coronary artery bypass grafting (CABG), commonly known as Heart Bypass, which bypasses stenotic arteries by grafting vessels from elsewhere in the body, is an alternative treatment. However, coronary revascularization by CABG is

associated with an increased risk of stroke ***(Palmerini et al., 2012).***

History of invasive and interventional cardiology Coronary angioplasty, also known as percutaneous transluminal coronary angioplasty (PTCA), because it is done through the skin and the lumen of the artery, was first developed in 1977 by Andreas Gruentzig. The first procedure took place Friday, Sept 16, 1977, in Zurich, Switzerland ***(Meier et al., 2003).***

Adoption of the procedure accelerated subsequent to Gruentzig's move to Emory University in the United States. Gruentzig's first fellow at Emory was MerrilKnudtson, who, by 1981, had already introduced it to Calgary, Alberta, Canada ***(Meier et al., 2003).***

By the mid-1980s, many leading medical centers throughout the world were adopting the procedure as a treatment for coronary artery disease. Angioplasty is sometimes erroneously referred to as "Dottering", after Interventional Radiologist, Dr. Charles Theodore Dotter, who, together with Dr. Melvin P. Judkins, first described angioplasty in 1964. As the range of procedures performed upon coronary artery lumens has widened, the name of the procedure has changed to percutaneous coronary intervention ***(Dotter & Judkins, 1964).***

Procedures

The term balloon angioplasty is commonly used to describe percutaneous coronary intervention, which describes the inflation of a balloon within the coronary artery to crush the plaque into the walls of the artery. While balloon angioplasty is still done as a part of nearly all percutaneous coronary interventions, it is rarely the only procedure performed.

Technique

The angioplasty procedure usually consists of most of the following steps and is performed by a team made up of physicians, physician assistants, nurse practitioners, nurses, radiographers, and cardiac invasive specialists; all of whom have extensive and specialized training in these types of procedures.

1. Access into the femoral artery in the leg (or, less commonly, into the radial artery or brachial artery in the arm) is created by a device called an "introducer needle". This procedure is often termed percutaneous access.

2. Once access into the artery is gained, a "sheath introducer" is placed in the opening to keep the artery open and control bleeding.

3. Through this sheath, a long, flexible, soft plastic tube called a "guiding catheter" is pushed. The tip of the guiding

catheter is placed at the mouth of the coronary artery. The guiding catheter also allows for radio-opaque dyes (usually iodine-based) to be injected into the coronary artery, so that the disease state and location can be readily assessed using real-time X-ray visualization.

4. During the X-ray visualization, the cardiologist estimates the size of the coronary artery and selects the type of balloon catheter and coronary guidewire that will be used during the case. Heparin (a "blood thinner" or medicine used to prevent the formation of clots) is given to maintain blood flow. Bivalirudin when used instead of heparin has a higher rate of myocardial infarction but lower rates of bleeding ***(Cavender & Sabatine, 2014).***

5. The coronary guidewire, which is an extremely thin wire with a radio-opaque flexible tip, is inserted through the guiding catheter and into the coronary artery. While visualizing again by real-time X-ray imaging, the cardiologist guides the wire through the coronary artery to the site of the stenosis or blockage. The tip of the wire is then passed across the blockage. The cardiologist controls the movement and direction of the guidewire by gently manipulating the end that sits outside the patient through the twisting of the guidewire.

6. While the guidewire is in place, it now acts as the pathway to the stenosis. The tip of the angioplasty or balloon catheter is

hollow and is then inserted at the back of the guidewire—thus the guidewire is now inside of the angioplasty catheter. The angioplasty catheter is gently pushed forward, until the deflated balloon is inside of the blockage.

7. The balloon is then inflated, and it compresses the atheromatous plaque and stretches the artery wall to expand. 8. If an expandable wire mesh tube (stent) was on the balloon, then the stent will be implanted (left behind) to support the new stretched open position of the artery from the inside ***(Jackson et al., 2014).***

Adverse events

Coronary angioplasty is widely practiced and has a number of risks; however, major procedural complications are uncommon. Coronary angioplasty is usually performed using invasive catheter-based procedures by an interventional cardiologist, a medical doctor with special training in the treatment of the heart ***(Grantham et al., 2017).***

The patient is usually awake during angioplasty, and chest discomfort may be experienced during the procedure. The patient remains awake in order to monitor the patient's symptoms. If symptoms indicate the procedure is causing ischemia the cardiologist may alter or abort part of the procedure. Bleeding from the insertion point in the groin (femoral artery) or wrist (radial artery) is common, in part due

to the use of antiplatelet drugs. Some bruising is, therefore, to be expected, but occasionally a hematoma may form. This may delay hospital discharge as flow from the artery into the hematoma may continue (pseudoaneurysm) which requires surgical repair. Infection at the skin puncture site is rare and dissection (tearing) of the access blood vessel is uncommon. Allergic reaction to the contrast dye used is possible, but has been reduced with the newer agents. Deterioration of kidney function can occur in patients with pre-existing kidney disease, but kidney failure requiring dialysis is rare. Vascular access complications are less common and less serious when the procedure is performed via the radial artery ***(Jang et al., 2012).***

The most serious risks are death, stroke, ventricular fibrillation (non-sustained ventricular tachycardia is common), myocardial infarction (heart attack, MI), and aortic dissection. A heart attack during or shortly after the procedure occurs in 0.3% of cases; this may require emergency coronary artery bypass surgery ***(Bittl, 2005).***

Chapter (2)

CHRONIC TOTAL OCCLUSION (CTO)

Chronic coronary total occlusions (CTO) can be considered the final stage of obstructive coronary artery disease (CAD) and are associated with a negative impact on long-term prognosis ***(Schumacher et al., 2018).***

Coronary CTOs are common, found in approximately one in three patients undergoing diagnostic coronary angiography (Table 1) ***(Azzalini et al., 2016).***

Among 14,439 patients undergoing coronary angiography at three Canadian centers, at least one CTO was present in 18.4% of patients with coronary artery disease (CAD). The CTO prevalence was higher (54%) among patients with prior coronary artery bypass graft surgery (CABG) and lower among patients undergoing primary PCI for acute ST-segment elevation myocardial infarction (10%) (Figure 4) ***(Wang et al., 2017).***

The prevalence of CTOs among patients with coronary artery disease was 16% and 13%, respectively.