Recent Advance in Drug Eluting Stent

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Drug eluting stent (DES) is the most advanced technology in the therapy for coronary stenosis. It is almost the final milestone of Percutaneous coronary intervention (PCI). PCI is a great advantage in the treatment of coronary artery disease. Before the development of PCI, most sick people have to go for major operation, such as CABG to relief ischemia from coronary stenosis. After the development of PTCA and stenting, only about 10% of coronary artery stenosis went for CABG. The minimal invasive nature of PCI helped people to suffer less from angina as well as major operation. However, after DES was introduced since 2003, the restenosis rate was much decreased. But there are some limitation remind in clinical application of DES to be justified in the future.

PTCA is the first step to start coronary intervention. Coronary dissection is inevitable while to dilate a tight coronary stenosis with a balloon catheter. In the early days of PTCA, coronary dissection was observed in about 35% patients after balloon dilatation. Recoil on the second day after balloon dilation was reported about 10% of the cases. Restenosis was found to 50% of cases afterwards, mostly happened within first three to six months.

The second milestone of PCI is the development of coronary stenting. The best way to overcome the complication of PTCA is to put a tubular metal stent in the dilated segment permanently. The metal stent acted as a tunnel in the coronary artery to support the artery to keep a patent channel, and smoothing the dissected surface to reduce thrombosis and regrowth of endothelium. By 1999, coronary bare metal stent (BMS) comprised 84.2 percent of PCI. However, BMS itself is a foreign body to our coronary artery, the restenosis rate from neointimal overgrowth was as high as 30% or more. Restenosis and repeat PCI still high after BMS.

The successful development of DES since 2003 in United States was regarded as the third milestone in PCI. Sirolimus-Eluting stents, or Cypher developed by Cordis, approved by FDA in 2003. Paclitaxel-eluting stent, or Taxus, developed by Boston Scientific’s, approved by FDA in 2004. Both showed effective in reduce restenosis rate to only 10% and greatly revascularization procedures afterwards. Both DES were much more expensive than BMS. DES has been applied to 80-90% of coronary stenosis in the majority of the world allover. Owing to the economic reason, DES were applied in only one fourth or one third of the patients in Taiwan,

and varied from institute to institute.

Since 2006, late thrombosis was reported increased in DES, acute myocardial infarction and mortality was found to be increased in patients treated with DES more than BMS in the first three years. Swedish report questioned seriously regarding whether DES is better than BMS, and should we continue to improve DES or return to BMS. It is a good time to look over this question.

The direction of further development after DES is known. No matter what kind of drug is used. The technology of newly developed DES should reduce incomplete coverage of endothelium, as well as reduce restenosis rate. The incidence of restenosis rate, late thrombosis, acute myocardial infarction and mortality should be improved better than BMS If possible. The thickness of stent should be thin so that it could be followed up by noninvasive methods. The price should be more reasonable so that which could be available to most people in need.

It is the time for us to think that no matter PTCA, BMS, or DES, it only relief the obstructed segment of coronary artery. The etiology to induce coronary stenosis is known which could not possible to be corrected with PCI. Other segments of the coronary tree still subject to further atherosclerotic invasion as long the survival subject goes on. Should we direct our therapeutic strategy towards reduce atherosclerosis more than dependent on DES only? It may be the best lesson we should learn from DES, to make DES as the final milestone in PCI.