Extending Donor Source With Bench Coronary Angiography: A Case Report
C.-F. Weng, C.-Y. Chang, Y.-T. Lee, S.-H. Sue, K.-C. Lee, Y.-C. Chuang, and J. Wei

ABSTRACT
This report proposes a safer, economical method to examine the marginal donor heart for a better chance of use, which also delivers comparable image quality of catheterization (CathLab) without creating potential damage to the kidney. Currently the examination of the coronary system mainly relies on the CathLab, which is not commonly accessible, and also results in nephrotoxic effects. Therefore, bench coronary angiography is hereby proposed because it is commonly available and economical as well as able to indicate coronary lesions for surgeons as well as the CathLab study. These benefits altogether provide a better chance to select usable hearts from older donors to help relieve the organ shortage.

T HIS report proposes a safer, economical method to examine a marginal donor’s heart for a better chance of use, which also delivers comparable image quality to a catheterization (CathLab) without creating potential damage to the kidney. Due to the scarcity of perfect hearts, it is inevitable to use marginal donor hearts. However, the diagnosis of an existing coronary arterial lesion in a marginal donor heart is always a challenge due to the availability of suitable equipment and the complete donor health records.

Currently examination of the coronary system mainly relies on the CathLab, but it is not commonly accessible in every hospital, or for every donor heart. Furthermore, it also adds more burden to the kidney due to the nephrotoxicity of the contrast medium. Therefore, bench coronary angiography is hereby proposed because it is commonly available and economical; also, it indicates the coronary lesions for surgeons as well as the CathLab study. In addition, it does not influence the kidney due to the nature of the bench coronary angiography process, which is performed without connection to other organs. These benefits altogether provide a better chance to select usable hearts from older donors and also to help relieve the organ shortage.

CASE REPORT
A 50-year-old man presented with dilated cardiomyopathy complicating a stroke; he was enrolled on our waiting list. During the period awaiting transplantation, he was usually admitted for treatment of heart failure and ventricular arrhythmias. A 51-year-old donor heart was harvested. We arranged bench coronary angiography after obtaining the donated heart. We used a soft, 12 G heparin needle and syringe (Fig 1). The nonionic iodinated contrast medium (Iopamiro) was directly injected manually into the orifices of the coronary arteries. The coronary angiography was performed using the General Electric OEC 9800. The patient experienced an uneventful recovery. The 1-year follow-up coronary catheterization showed a similar result to the one obtained using bench coronary angiography (Fig 2).

DISCUSSION
Use of a marginal donor heart always strikes fear in cardiovascular surgeons. Because the top two major concerns are the doubtful recipient survival with a suboptimal heart and whether a pre-existing coronary lesion will exacerbate allograft vasculopathy. Nevertheless, some research has shown that these concerns should not be excessive; a heart from an older donor can still perform as well as a standard heart when appropriate procedures are taken. With careful selection, the mid-term and long-term survival rates are identical between transplantation of aged (older than 50 years) and standard donor hearts.1,2 Lietz et al reported that cardiac transplant recipients of allografts from older donors have better chance to survive than the from older donors have better chance to survive than the...
mortality rate on the transplant waiting list.\textsuperscript{3} There is no reason to reject any marginal donor heart when there are strict selection processes.

Some research outcomes have also shown that the pre-existing coronary arterial lesion does not affect the formation of allograft vasculopathy. The pathogenesis of allograft vasculopathy and arteriosclerosis are distinct from one another.\textsuperscript{4} Botas et al used intravascular ultrasound to investigate allograft vasculopathy showing that pre-existent donor coronary artery disease does not accelerate the progression of allograft vasculopathy.\textsuperscript{5} Another study also indicated that there were similar development rates of de novo vascular lesions among patients with versus without pre-existing lesions; de novo vascular lesions did not worsen the pre-existing lesions.\textsuperscript{6}

To maximize the success of transplantation of suboptimal hearts, it is imperative to perform a detailed examination of the coronary system. The current practice is to perform coronary angiography in the CathLab. But this presents problems for the availability of the CathLab and for the nephrotoxicity of the contrast medium. Bench coronary angiography instead is a better choice in terms of the above issues.

The key differences of bench coronary angiography are its common availability and absence of toxicity of contrast medium to the kidneys. Even with the most basic C-arm without the function of digital subtraction angiogram, one can produce a fairly good quality of images, because the harvested heart is flaccid and quiet without hemodilutional effects from blood flow. It does not create any potential damage to the donor’s kidneys, because the entire process is performed solely on the heart. Regarding the toxicity to the heart itself, the toxicity of the contrast medium can be mitigated by applying a less toxic, nonionic, low-osmolarity contrast medium, removing the contrast medium immediately after the examination because the toxicity is mainly through the endothelial cells of vessels.\textsuperscript{7,8}

In conclusion, the proposed bench coronary angiography is an easy, accessible, affordable tool to screen usable suboptimal hearts without potential damage to other organs. With this method, surgeons no longer have to rely only on the CathLab, but still can achieve similar results plus maximize the use of available, donated hearts.

REFERENCES