QUANTIFYING CORONARY BLOOD FLOW OF THE RIGHT CORONARY ARTERY IN THE ACUTE CORONARY SYNDROME BY AN DYNAMIC ANGIOGRAPHY AND MACHINE LEARNING ANALYSIS

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INTRODUCTION

In percutaneous coronary intervention (PCI), the Thrombolysis in Myocardial Infarction (TIMI) Myocardial frame count (TMFC) is frequently used to estimate coronary flow and assess post–PCI restoration.
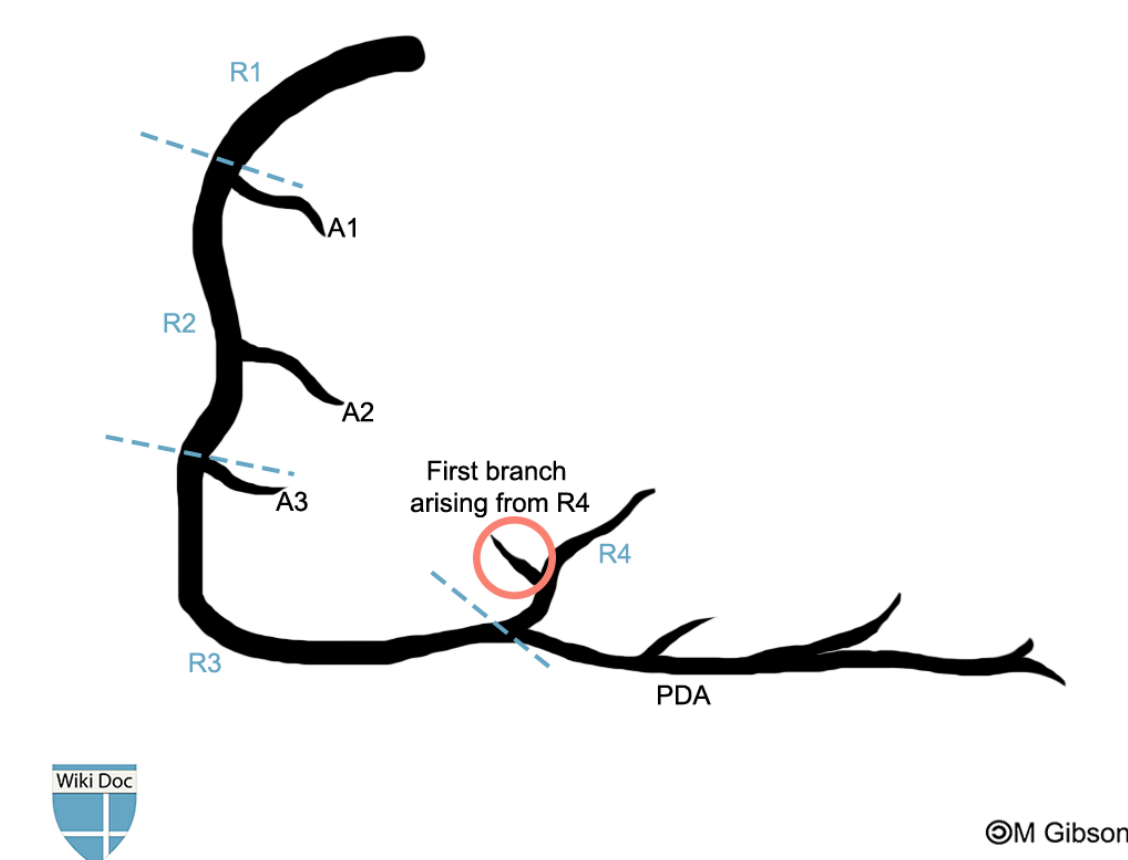

Fig 1: TIMI frame count landmark for the RCA
The landmark used in the right coronary artery is the first branch arising from the posterior lateral extension of the right coronary artery after the origin of the posterior descending artery
R1= Proximal right coronary artery; R2= Mid right coronary artery; R3= Distal right coronary artery; R4= Right posterolateral artery; A1, A2, A3= Acute marginal arteries; PDA= Posterior descending artery.

However, it is dependent on the contrast injection force. Hence, how can we quantify the coronary flow in an independent, realistic situation?

METHODS

Control group: (1) non–significant coronary lesions, (2) normal ejection fraction, (3) no valvular disease, (4) NO PMH of ACS
Study group: (1) Acute coronary syndrome (ACS) patients, (2) single lesion in the right coronary artery (RCA)

– All patients underwent a novel dynamic angiography technique.

New dynamics angiographic

– The length of CAG videos must record until contrast totally disappeared.

– The whole of the coronary artery was totally inside the screen

– Recorded the flow at 15 frames per second (0.06 seconds each frames).

REVIEW

– At first, the contrast (seen as black) was injected until the index coronary artery was filled completely and all the images of the whole vessel were included inside the screen. (Fig 2A)

– The flow characteristics, direction, borders, and shape of the tip could be observed (Fig 2B)

The arterial phase (AP) calculation started when the blood began moving and ended when all the contrast was flushed out of the distal arterial vasculature.
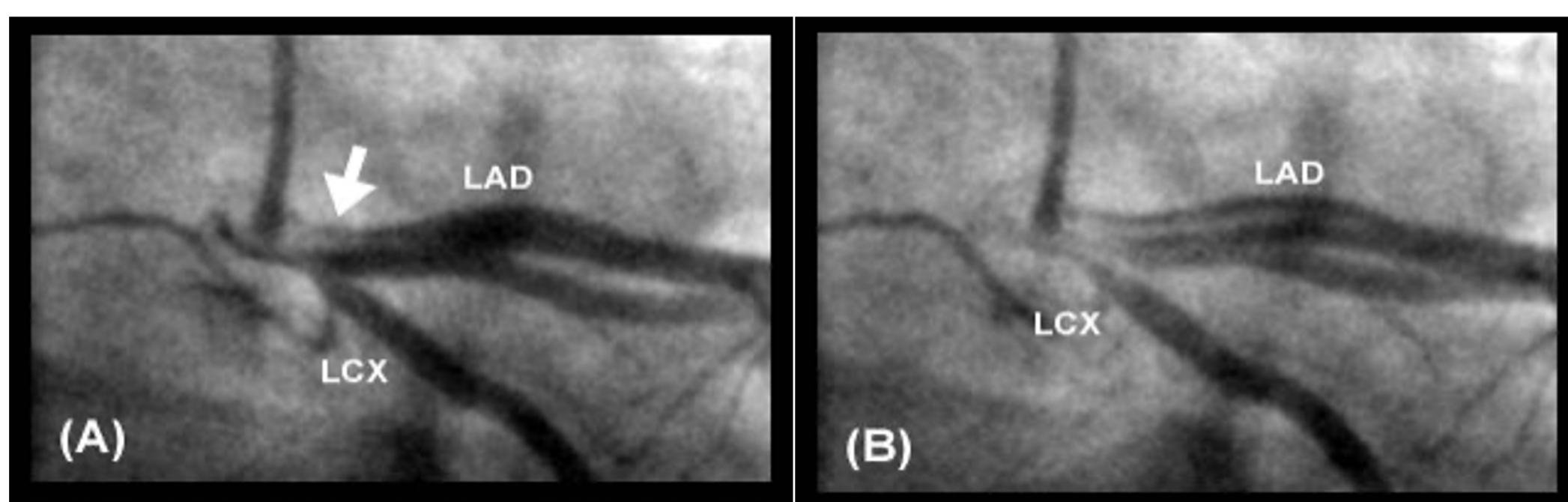
Pic 1; (A) blood began moving, (B) flow characteristics, direction, borders, and shape of the tip
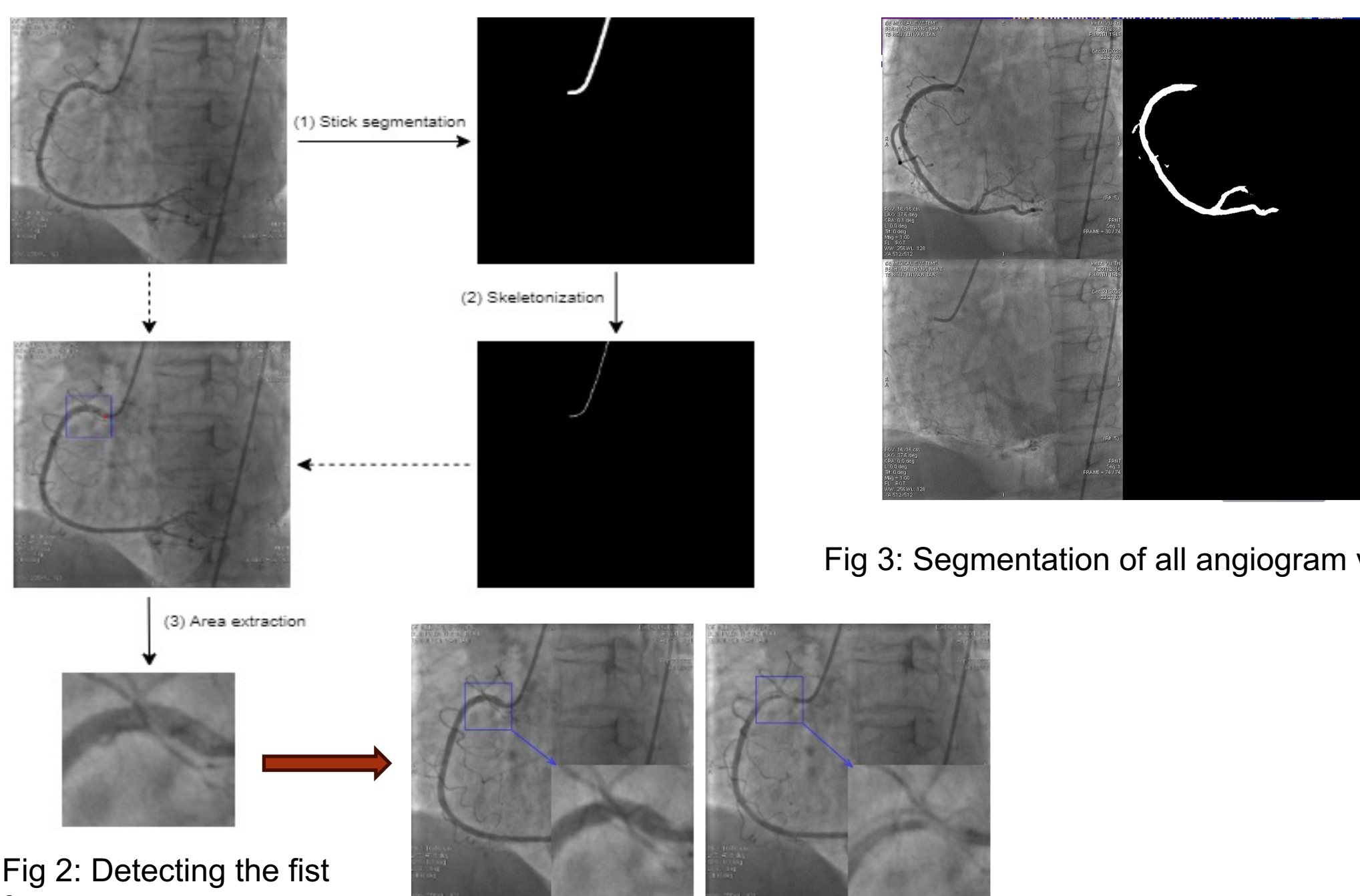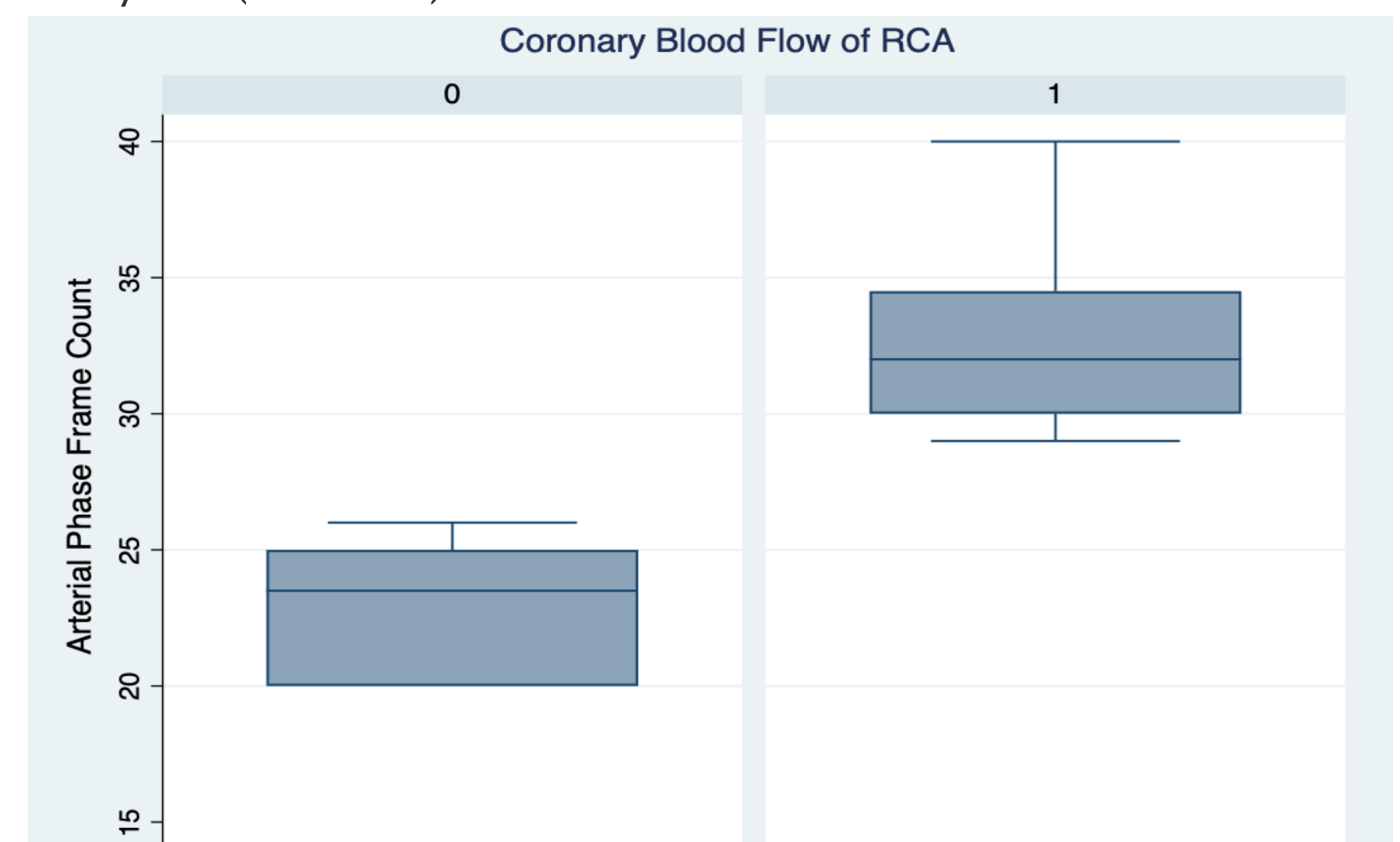

Fig 3: Segmentation of all angiogram videos
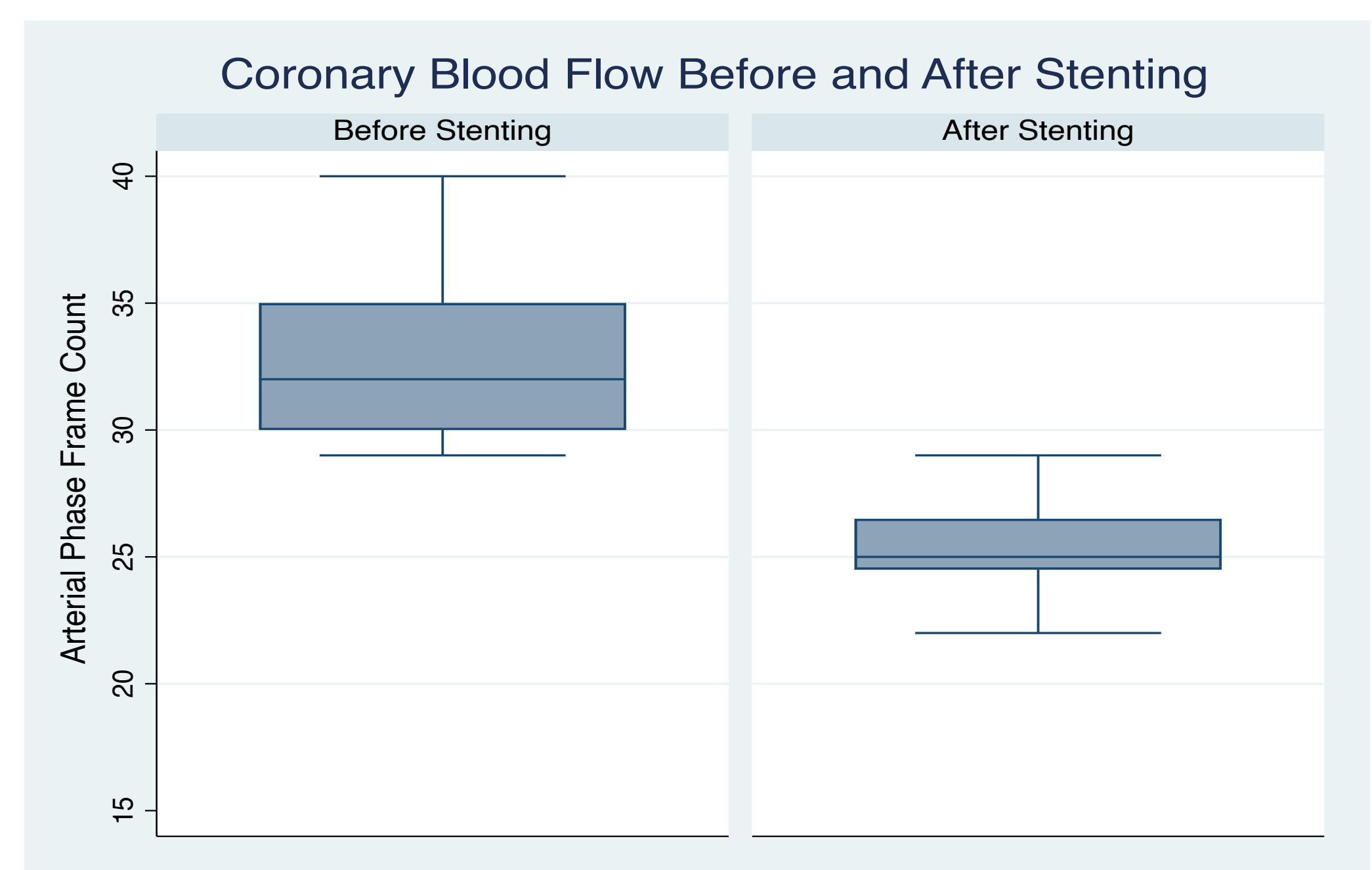

Fig 2: Detecting the fist frame

RESULTS

The study included 30 cases (10 from the control group) with a mean age of 64.4±12 years (24 males).

In the control group, the AP was 25 ± 2.6 frames compared with 33 ± 3.3 frames for the study group before patient underwent PCI (p<0.05).

After PCI, the AP was restored to 25.3±2.4 frames.
ML model was successfully developed with a root mean square error 5.4s.

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