The relation of the SYNTAX score with myocardial ischemia
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Background
The SYNTAX score has recently been developed in connection with the SYNTAX trial, which compares the impact of CABG and PCI on survival in patients with extensive coronary artery disease (CAD). Although the SYNTAX score was used in the trial to characterize coronary anatomy based on nine anatomic criteria such as lesion location and complexity, the relation between SYNTAX score and myocardial ischemia has not yet been evaluated.

Purpose
The aim of this study was to examine whether the SYNTAX score had a relation with myocardial ischemia as assessed by myocardial perfusion imaging.

Methods
1. Patients characteristics
Database of 175 patients with suspected or known CAD who underwent both technetium-99m sestamibi SPECT and coronary angiography was evaluated. All of the patients underwent coronary angiography within 3 months of gated SPECT. The followings were criteria for exclusion:

(1) acute coronary syndrome
(2) history of previous myocardial infarction
(3) history of coronary artery bypass graft surgery

2. Stress technetium-99m sestamibi SPECT
All patients underwent an exercise or ATP (0.16mg/kg/min) stress/rest myocardial SPECT study according to a one-day protocol with technetium-99m sestamibi. SPECT image was acquired >30 min after the stress and 4 hours later and scored using a 17-segment model. The summation score for all of the segments scored during exercise and at rest was designated as the summed stress score (SSS) and the summed rest score (SRS), respectively. The sum of the differences between the SSS and SRS was defined as the summed difference score (SDS) to assess the overall extent and severity of stress-induced myocardial ischemia.

3. Coronary angiography and SYNTAX score
All of the patients underwent coronary angiography within 3 months of stress myocardial SPECT. Each coronary lesion producing >50% luminal obstruction lumen in vessels ≥1.5mm was separately scored using SYNTAX score calculator and added to provide the overall SYNTAX score (available at http://www.syntaxscore.com).

An example of SYNTAX score calculation in 1 subject is shown blow.

Segment weight factors

Lesions adverse characteristic scoring

Lesion 1
(segment 2): 1 × 2 = 2
Sub total lesion 1
2
Lesion 2
(segment 4): 1 × 2 = 2
Sub total lesion 2
2
Lesion 3
(segment 6): 3.5 × 2 = 7
Sub total lesion 3
7
Lesion 4
(segment 13): 0.5 × 2 = 1
Length > 20 mm
1
Sub total lesion 4
2
TOTAL: 13

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Clinical Characteristics

| Age (years) | 65 ± 11 |
| Gender (Men / Women) | 134 / 41 |
| Hypertension (%) | 121 (69) |
| Diabetes Mellitus (%) | 68 (39) |
| Hyperlipidaemia (%) | 109 (62) |
| Stress protocol (Ex / ATP) | 99 / 76 |

No. of diseased vessels (%)

- left main or 3-vessel: 46 (26)
- 2-vessel: 46 (26)
- 1-vessel: 29 (17)
- insignificant lesions: 54 (31)

Image Acquisition

| Isotope | 99mTc-sestamibi |
| Protocol | 1 day protocol |
| Injected dose | 1036 MBq (stress : 259MBq, rest : 777MBq) |
| Camera | Picker Prism 3000XP |
| Energy High-resolution collimator | Low-energy high-resolution collimator (LEHR) |
| Matrix size | 64 × 64 |
| R-R interval | 6.5-6 projections, 30 sec |
| Collimator | Butterworth filter, Order 8 |
| Cut off frequency | 0.25 cycle/cm |
| Reconstruction | Filtered back projection with a ramp filter |

Image Assessment - 17-Segment Visual Analysis -

- Short Axis: Distal, Mid, Basal
- Long Axis: Distal, Mid

Correlation between SYNTAX score and SSS, SDS

- Low score group (SYNTAX score ≤22)
  - SSS: r=0.572, p<0.0001
  - SDS: r=0.573, p<0.0001

- Intermediate to severe score group (SYNTAX score >22)
  - SSS: r=0.535, p<0.0001
  - SDS: r=0.551, p<0.0001

Summary

- Of the 175 patients, left main or 3-vessel CAD was found in 46, 2-vessel CAD in 46, 1-vessel CAD in 29, and insignificant lesions in 34.

- The SSS and SDS correlated well with SYNTAX score (r=0.572; p<0.0001 and r=0.573; p<0.0001).

- In 41 patients with intermediate to severe SYNTAX score group (SYNTAX score >22), the prevalence of male gender, diabetes mellitus and multivessel CAD were higher, and an SSS and SDS were greater than in 134 patients with low SYNTAX score group (SYNTAX score ≤22), whereas age and other coronary risk factors were similar.

- In 134 patients with the low SYNTAX score group, the SSS and SDS also correlated with SYNTAX score (r=0.535; p<0.0001), whereas no such correlation was observed in the intermediate to severe SYNTAX score group (r=0.066; p=NS and r=0.200, p=NS).

Conclusion

The SYNTAX score correlates well with myocardial ischemia as assessed by stress SPECT as a whole. However, the higher the score increases, the correlation with the extent of myocardial ischemia becomes less apparent.