Intravascular ultrasound (IVUS) with the spectral analysis of radiofrequency data analysis (virtual histology: VH-IVUS) has demonstrated the ability to characterize plaque into 4 distinct types: fibrous, fibro fatty, dense calcification and necrotic core. Recently, a 40 MHz mechanical rotational IVUS imaging system has shown similar ability in plaque characterization (i-MAP: fibrotic, lipidic and necrotic, calcified). However, validation of these two plaque characterization technologies by spectral radiofrequency IVUS has not been well clarified.

**Methods:** A plaque characteristics comparison using IVUS-VH and i-MAP was performed in 845 cross-sections of 83 patients with stable angina at pre-intervention. IVUS catheter was advanced >10 mm distal to the lesion, and withdrawn automatically to a point >10 mm proximal to the lesion. Conventional IVUS images and radiofrequency signals were acquired and stored for off-line analysis. Based on the reference landmark, such as plaque or calcification deposition, or small branch, corresponding two cross-sections by grayscale IVUS were compared with both plaque characterization software. Differences of resolution power due to frequency (20 or 40 MHz) may impact on grayscale image, especially within deep vessel area. Therefore, images were recorded for offline analysis. Images were analyzed based on the virtual histology: VH (Volcano Therapeutics, Rancho Cordova, CA) and i-MAP (40 MHz mechanical rotational IVUS system (Atlantis SR Pro2, Boston Scientific, Natick, MA)) software.

**Results:** Average lumen, vessel and plaque area were identical between the two groups. However, in comparison of relative plaque component, larger fibrotic in i-MAP and larger dense calcium in VH-IVUS were observed (Table). Furthermore, in cases of larger calcium segments (Dense calcium>25%, n=338) in VH-IVUS, necrotic components were larger than i-MAP (28.4 vs. 13.1%, p<0.0001).

**Conclusions:** Coronary plaque characterization differed between the two coronary plaque characterization software systems. Although difference of resolution power due to frequency (20 or 40 MHz) may be associated with the results of plaque characteristics, further investigation may be required for clinical implications.

**Comparison of Necrotic Components in Larger Calcium Segments (Dense calcium>25%)**

<table>
<thead>
<tr>
<th>Component</th>
<th>VH-IVUS</th>
<th>i-MAP</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Necrotic Core</td>
<td>13.1%</td>
<td>28.4%</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

**Summary**

1. Average lumen, vessel and plaque area were identical between the two groups. However, in comparison of relative plaque component, larger fibrotic in i-MAP and larger dense calcium in VH-IVUS were observed.
2. Larger necrotic in i-MAP and larger dense calcium in VH-IVUS were observed.
3. Larger calcium segments (Dense calcium>25%, n=338) in VH-IVUS, necrotic components were larger than i-MAP (28.4 vs. 13.1%, p<0.0001).

**Limitations**

- Small population study
- Selection bias
- Enrolled only stable angina patients
- Difference of IVUS frequency (20 or 40 MHz) may impact on grayscale image, especially within deep vessel area
- Unmeasured area of VH-IVUS, defined as “Media” may impact on comparison of plaque components (See arrow)

**Conclusions**

Coronary plaque characterization differed between the two coronary plaque characterization software systems. Although difference of resolution power due to frequency may be associated with the results of plaque characteristics, further investigation may be required for clinical implications.