How to make an excellent Nuclear Cardiology report

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Structured report

• Contain sufficient information to convey details of the procedure and at the same time remain succinct
• Should provide basic “bottom line” result to the referring physician
ASNC IMAGING GUIDELINES FOR NUCLEAR CARDIOLOGY PROCEDURES

Standardized reporting of radionuclide myocardial perfusion and function

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The IAC Standards and Guidelines for Nuclear/PET Accreditation

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Reporting nuclear cardiology: a joint position paper by the European Association of Nuclear Medicine (EANM) and the European Association of Cardiovascular Imaging (EACVI)

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What is a Standardized /Structured report?

- Use of standardized terms/definitions
- Standardized report segments
  - Demographics
  - Indications
  - Clinical history
  - Procedure
  - Findings
  - impression
- Standardized/Defined terminology for each finding
  - Eg defect size “small” (1-2 segments), “medium” (2-4), “large” (>5) of 17 segment model
- Guide standardized interpretation
- Report variables may be:
  - Required, Recommended, Optional

• Avoid technical terms
  • ("after attenuation correction, Images appear normal")

• Avoid abbreviations
  • (" TID is present")

• Quantitative descriptions preferred over Qualitative descriptions
  • (Severe perfusion defect involving approx 25% of Left Ventricle)

• Avoid protective descriptions
  • ("is likely", “cannot be excluded”, probably")

• Findings vs conclusions
  • ("reversible/fixed" vs “ischemia/infarction")
Indications

• Chest pain
• Pre operative evaluation (including type of surgery)
• CAD
• Heart failure
• Coronary risk factors
• Dyspnoea
• Post CABG, PTCA
• Abnormal stress test, abnormal ECG, arrhythmia, SVT
• Viability
Clinical history

• Chest pain
  • Typical anginal, atypical, non anginal, angina equivalent, none

• Medication
  • Beta blockers, Ca channel blockers, nitrates, aminophylline

• Cardiac risk factors
  • Hypertension, diabetes, Cholesterol, smoking, obesity, family history, chronic renal disease, peripheral vascular disease

• Cardiac history
  • CABG, PTCA, Failure, arrhythmia

• Pretest probability of CAD (Diamond and Forrester)
Procedure

• **Description of the stress test performed**
  • Stress protocol
    • Exercise, pharmacological (dipyridamole, adenosine, regadenoson)
    • Isotope used and dose
  • Parameters of the stress protocol
    • Duration of exercise
    • Heart rate achieved as % of MHR (age-220)
    • Heart rate recovery (Normal >10 bpm, abnormal < 10 bpm)
    • Stress BP
    • Anginal symptoms
    • Reason for termination
    • ECG findings at rest and stress
Findings

Perfusion Defects should be described as follows:

**Size:**
- Small (1-2 segments)
- Medium (3-4 segments)
- Large (5 or more segments)
- TID

**Severity:**
- Mild
- Moderate
- Severe

**Reversibility:**
- Reversible
- Mixed
- Persistent

**Location:**
- 17 segment model

![Left Ventricular Segmentation]

1. basal anterior  
2. basal anteroseptal  
3. basal inferoseptal  
4. basal inferior  
5. basal inferolateral  
6. basal anterolateral  
7. mid anterior  
8. mid anteroseptal  
9. mid inferoseptal  
10. mid inferior  
11. mid inferolateral  
12. mid anterolateral  
13. apical anterior  
14. apical septal  
15. apical inferior  
16. apical lateral  
17. apex
<table>
<thead>
<tr>
<th>Tracer distribution</th>
<th>Must be included</th>
<th>Should be included</th>
<th>May be included</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Brief description</td>
<td>Preferably using the 17-segment model&lt;sup&gt;9&lt;/sup&gt;</td>
<td>Other comments to perfusion distribution abnormalities</td>
</tr>
<tr>
<td>Abnormal</td>
<td>Presence of defect(s)</td>
<td>Suggestion of single- or MV disease</td>
<td>Relation to standard coronary anatomy with reservations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preferably using the 17-segment model&lt;sup&gt;9&lt;/sup&gt;</td>
<td>regarding anatomy variations</td>
</tr>
<tr>
<td>Location of defect(s)</td>
<td>Relation to LV segments,</td>
<td>Quantification as percentage or a percentage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>relation to the patient’s</td>
<td>interval of the LV&lt;sup&gt;a&lt;/sup&gt;; alternatively in summed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>coronary artery distribution</td>
<td>scores</td>
<td></td>
</tr>
<tr>
<td></td>
<td>if known</td>
<td>Quantified in summed stress/rest/difference scores&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>Extent of defect(s)</td>
<td>Description of defect size(s). ‘Large’, ‘small’, etc. is a minimum</td>
<td>Quantified in summed difference scores&lt;sup&gt;b&lt;/sup&gt;</td>
<td></td>
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<tr>
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<tr>
<td>Severity of defect(s)</td>
<td>Description of defect severity. ‘Mild’, ‘severe’, etc. is a minimum</td>
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<tr>
<td></td>
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<tr>
<td>Reversibility of defect(s)</td>
<td>Reversible (stress-induced), fixed (permanent and irreversible), or mixed (partially reversible) defect(s)</td>
<td></td>
<td></td>
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<tr>
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<td></td>
</tr>
<tr>
<td>Quantification of regional perfusion in PET</td>
<td></td>
<td>Absolute values in ml/min/g tissue at rest/during hyperaemia, including reference values. Coronary flow reserve in units</td>
<td></td>
</tr>
<tr>
<td>Other abnormalities</td>
<td>Incidental extracardiac findings</td>
<td></td>
<td>Deviations in tracer distribution (locally increased/decreased uptake, LV cavity dimensions)</td>
</tr>
<tr>
<td>Non-diagnostic study</td>
<td>Describe the reason</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Wall motion:
  • You must state the quantitative LVEF%

Wall Motion Defects Must Be Described As:
  • Mild Hypokinesis
  • Moderate Hypokinesis
  • Severe Hypokinesis
  • Akinesis
  • Dyskinesis

Abnormal Overall LV Systolic Function Must be Characterized:
  • \((EF = 50\% - 70\%)\) = Normal
  • \((EF = 40\% - 49\%)\) = Mildly reduced
  • \((EF = 30\% - 39\%)\) = Moderately reduced
  • \((EF = \text{less than } 30\%)\) = Severely reduced
  • \((EF = 71\% \text{ Or greater})\) = Hyperdynamic
<table>
<thead>
<tr>
<th>LV function</th>
<th>Must be included</th>
<th>Should be included</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVEF</td>
<td>Numerical values</td>
<td>Reference values</td>
</tr>
<tr>
<td>LV volumes</td>
<td></td>
<td>Numerical values (with reference values)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Presence of TID (visual evaluation and/or quantified)</td>
</tr>
<tr>
<td>WM</td>
<td></td>
<td>Visual evaluation: normal, hypokinesia (mild, moderate, and severe), akinesia, or dyskinesia</td>
</tr>
<tr>
<td>WT</td>
<td></td>
<td>Visual evaluation: normal, decreased (mild, moderate, and severe), or absent</td>
</tr>
<tr>
<td>Phase analysis</td>
<td></td>
<td>Dyssynchrony</td>
</tr>
<tr>
<td>Differences between stress and rest global and regional LV function</td>
<td>Stress-induced LV dilatation (TID)</td>
<td>Comment on differences</td>
</tr>
<tr>
<td>Findings that may reduce the accuracy of the assessment of LV function</td>
<td></td>
<td>Other comments (i.e. cardiac arrhythmias)</td>
</tr>
<tr>
<td>Local perfusion/WM or WT relationship</td>
<td></td>
<td>A comment</td>
</tr>
<tr>
<td>Non-diagnostic study</td>
<td>Describe the reason</td>
<td></td>
</tr>
</tbody>
</table>

LV, left ventricular; EF, ejection fraction; TID, transient ischaemic dilatation; WM, wall motion; WT, wall thickening.
<table>
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<th>May be included</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Myocardial perfusion SPECT</strong></td>
<td>Defect suggesting stress-induced ischaemia or scar tissue. Location and extension/severity</td>
<td>Defect: Extent and severity quantified. Relation of defect to coronary anatomy and/or stenosis if reported/available</td>
</tr>
<tr>
<td><strong>Functional data from gated myocardial perfusion SPECT</strong></td>
<td>Stress and rest (if available) LVEF and change from rest to stress. Reference values for LVEF. LV dilatation, TID. Concordances and discrepancies between perfusion and wall motion, if observed</td>
<td>LV volumes and regional function. Synchrony</td>
</tr>
<tr>
<td><strong>ERNV</strong></td>
<td>LVEF value with reference values. Significant change from a previous EF value</td>
<td>LV volumes</td>
</tr>
<tr>
<td><strong>Viability imaging</strong></td>
<td>Viable or non-viable tissue. Summary of the location and extent of viable tissue (% of LV)</td>
<td>Extracardiac FDG accumulations</td>
</tr>
<tr>
<td><strong>Hybrid imaging</strong></td>
<td>Integration of both imaging modalities. Otherwise similar to stand-alone studies</td>
<td>Comparison between quantified stenosis and quantified stress-induced perfusion defect. Integrated risk stratification</td>
</tr>
<tr>
<td><strong>$^{123}$I-MIBG</strong></td>
<td>Normal or reduced $^{123}$I-MIBG uptake. Significantly abnormal H/M ratios and/or washout rate. Possible perfusion/innervation mismatch</td>
<td>Prognostic information (if relevant)</td>
</tr>
</tbody>
</table>

EF, ejection fraction; ERNV, equilibrium radionuclide ventriculography; FDG, $^{18}$F-fluoro-deoxyglucose; LV, left ventricular; TID, transient ischaemic dilatation.
Impression/ conclusion

• Succinct impression/conclusion
• Clear statement of “normal” or “abnormal” for perfusion and function
• Summary of significant findings using appropriate terminology (eg. Abnormal myocardial perfusion with large area of severe ischemia in the distribution of left anterior descending artery)
• Information on technical errors, suboptimal quality, abnormal extracardiac uptake mentioned
• Provide answer to the clinical question
• Correlate to prior testing or other relevant studies
• Further diagnostic investigation may be suggested
Communication is everything

- It is crucial that the referring or treating physician understands the report as it is intended by the interpreting physician.
THANK YOU