ΔSUV evaluation in DLBCL

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Criteria for interim PET assessment
Quantitative analysis in AOM00152

- Retrospective analysis
- 92 pts with DLBCL, median f-u 4 y

Baseline PET:
- $SUV_{\text{max}}$ in the most active lesion
- whichever CT size or location

Interim PET:
- if (+) $\rightarrow$ in the most active lesion
- if (–) $\rightarrow$ in the area of $\text{PET}_0$ tumor

Calculation of % of $SUV_{\text{max}}$ reduction
Optimal cut-offs determined by ROC

Visual vs. quantitative analysis
2 cycles, n=92

Visual analysis
*(Créteil, MRU)*

Quantitative analysis
*(SUV$_{\text{max}}$ at 2 cycles)*

Quantitative analysis
*(% reduction SUV$_{\text{max}}$)*

→ Reduction of 14/17 false positives
→ Cut-off may vary with histology, treatment, PET center

Visual vs. quantitative analysis
4 cycles, n=80

→ Reduction of false positives if we wait for 4 cycles
→ Juweid criteria acceptable, Créteil slightly better
→ Visual analysis reliable, ΔSUV more objective

Qualitative assessment at 4 cycles
Independent prognostic factor

<table>
<thead>
<tr>
<th>Overall Model Fit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null model -2 Log Likelihood</td>
</tr>
<tr>
<td>Full model -2 Log Likelihood</td>
</tr>
<tr>
<td>Chi-square</td>
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<tr>
<td>DF</td>
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<tr>
<td>Significance level</td>
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<table>
<thead>
<tr>
<th>Coefficients and Standard Errors</th>
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<tbody>
<tr>
<td>Covariate</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>PET4vis</td>
</tr>
<tr>
<td>IPI</td>
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<tr>
<td>ASCT</td>
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<tr>
<td>GC_NGC</td>
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<tr>
<td>Ritux</td>
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</tbody>
</table>

→ Independent from IPI, treatment regimen, gene profiles
Quantitative assessment at 2 cycles
Independent prognostic factor

→ ΔSUV reflects tumoral destruction kinetics
Association of both ΔSUV-PET2 and visual-PET4

Overall Model Fit

<table>
<thead>
<tr>
<th>Covariate</th>
<th>b</th>
<th>SE</th>
<th>P</th>
<th>Exp(b)</th>
<th>95% CI of Exp(b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PET2red4vis</td>
<td>1,2301</td>
<td>0,274</td>
<td>0,0000</td>
<td>3,4215</td>
<td>2,0050 to 5,8389</td>
</tr>
<tr>
<td>IPI</td>
<td>0,1147</td>
<td>0,2053</td>
<td>0,5764</td>
<td>1,1215</td>
<td>0,7555 to 1,5720</td>
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<tr>
<td>ASCT</td>
<td>-0,8722</td>
<td>0,5177</td>
<td>0,0920</td>
<td>0,4180</td>
<td>0,1575 to 0,8189</td>
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<tr>
<td>GC_NGC</td>
<td>0,2953</td>
<td>0,4776</td>
<td>0,5364</td>
<td>1,3435</td>
<td>0,5156 to 3,4215</td>
</tr>
<tr>
<td>Ritux</td>
<td>-0,2408</td>
<td>0,4791</td>
<td>0,6153</td>
<td>0,7860</td>
<td>0,3056 to 1,7020</td>
</tr>
</tbody>
</table>

P = 0,0002

n=60

n=10
Limitations of $\Delta$SUV

- Necessity of a baseline PET
- Tumors with baseline uptake $<10.0$
- SUV variability/normalization to internal bkg
- No external validation
Tumors with baseline uptake <10.0
influence of baseline SUV on $\Delta$SUV

No event, EFS = 0
(n=60)

Event, EFS = 1
(n=32)

$\rightarrow$ 3 FP pts w/ baseline SUV<10.0, $\Delta$SUV<66%, no event
SUV variability
normalization to liver activity

Raw $\Delta$SUV
*(cut-off 66%)*

$\Delta$SUV / liver
*(cut-off 66%)*

$\Delta$SUV / liver
*(cut-off 60%)*

$\Delta$SUV = 100 \times \frac{\text{SUV}_{T1}/\text{SUV}_{L1} - \text{SUV}_{T2}/\text{SUV}_{L2}}{\text{SUV}_{T1}/\text{SUV}_{L1}}$
SUV variability
normalization to MBP activity

![Graphs showing survival probability with SUV variability normalization to MBP activity](image)

$$\Delta \text{SUV} = 100 \times \frac{\text{SUV}_{T1}/\text{SUV}_{M1} - \text{SUV}_{T2}/\text{SUV}_{M2}}{\text{SUV}_{T1}/\text{SUV}_{M1}}$$
Conclusions

- Must follow strict procedure for injection, delay between injection and scanning, glucose level
- Same procedure to identify SUVmax, with help of the MIP, graded color scale
- No need for an internal reference
- External validation: ongoing (PETAL, IVS)