Comparison of visual versus reader results of the point of care test of direct oral anticoagulants from urine samples

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INTRODUCTION

Direct oral anticoagulants (DOAC) are increasingly used for anticoagulation. In emergency situations, a quick and safe method to detect or exclude the presence of DOACs may guide clinical decision-making. Because DOACs are excreted via the kidney, they can be detected in the urine with the point of care test DOAC Dipstick. DOAC concentrations are manifold higher in urine compared to plasma, which is important for normal ranges.

AIM

To identify concentrations of DOACs providing 100% negative (DOAC absent) or 100% positive (DOAC present) results for each of the two methods of determination (i.e. naked eye or photometric reader (DOASENSE Reader, CE-labelled).

METHOD

Samples of artificial urine (n=324) were spiked with concentrations of DOACs ranging from 0 ng/mL to 325 ng/mL. Visual method (figure 1): 3 examiners independently identified in triplicate the colours of the pads of DOAC Dipsticks for positive or negative for factor Xa inhibitors (DXI: apixaban, edoxaban, rivaroxaban) and thrombin inhibitor (DTI) dabigatran on the respective test pads of DOAC Dipstick by comparison with the colour label on the test tube. Reader method (figure 2): 4 photometric readers were used to identify the colours of the FXA pad and THR pad.

Concentrations of DOACs represent the limits in urine samples for negative and positive results.

Documentation: Negative and positive results of the respective concentration ranges of DOAC are documented for both methods for the comparison.

RESULTS

Table 1: The results of DXI and DTI are categorized as “NEGATIVE” or “negative or positive” or “POSITIVE” (column 1 to 7, line 1 and 2).

<table>
<thead>
<tr>
<th>Methods</th>
<th>Visual</th>
<th>Reader</th>
<th>Visual</th>
<th>Reader</th>
<th>Visual</th>
<th>Reader</th>
<th>Visual</th>
<th>Reader</th>
</tr>
</thead>
<tbody>
<tr>
<td>Results</td>
<td>NEGATIVE</td>
<td>negative or positive</td>
<td>POSITIVE</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DXI ng/ml</td>
<td>&lt;100</td>
<td>&lt;100</td>
<td>100-200</td>
<td>100-275</td>
<td>&gt;200</td>
<td>&gt;275</td>
<td>452</td>
<td>452</td>
</tr>
<tr>
<td>DTI ng/ml</td>
<td>&lt;50</td>
<td>&lt;75</td>
<td>50-125</td>
<td>75-300</td>
<td>&gt;125</td>
<td>&gt;300</td>
<td>428</td>
<td>428</td>
</tr>
</tbody>
</table>

Legend: The three categories of results of visual and reader analysis. Differences of concentrations are clinically not relevant.

Figure 1: Schematic representation of three DOAC Dipsticks divided into areas "DOAC Analysis" and "Control"

Figure 2: Schematic representation of three DOAC Dipsticks divided into areas "DOAC Analysis" and "Control"

Figure 1: Photo of DOASENSE Reader together with DOAC Dipstick box and tube and sticks.

Figure 2: Photo of DOASENSE Reader with four DOAC Dipsticks. The tube with the label contains 12 strips and is conserved in the box.

Figure 3: Photo of DOASENSE Reader together with DOAC Dipstick box and tube and sticks.

Figure 4: Photo of DOASENSE Reader together with DOAC Dipstick box and tube and sticks.

Table 2: The results of visual and reader analysis are shown for samples containing concentrations below or above or in between the limits given in table 1 for DXI an DTI as % of total number analysed.

<table>
<thead>
<tr>
<th>Methods</th>
<th>Visual</th>
<th>Reader</th>
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<th>Reader</th>
<th>Visual</th>
<th>Reader</th>
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<th>Reader</th>
</tr>
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<tbody>
<tr>
<td>Results</td>
<td>NEGATIVE</td>
<td>negative or positive</td>
<td>POSITIVE</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DXI</td>
<td>3.3%</td>
<td>3.3%</td>
<td>3.8%</td>
<td>5.3%</td>
<td>92.9%</td>
<td>91.4%</td>
<td>452</td>
<td>452</td>
</tr>
<tr>
<td>DTI</td>
<td>0.5%</td>
<td>0.5%</td>
<td>0.7%</td>
<td>2.8%</td>
<td>98.8%</td>
<td>96.7%</td>
<td>428</td>
<td>428</td>
</tr>
</tbody>
</table>

Legend: Comparison of the results of visual versus reader analysis of DXI and DTI pads of DOAC Dipsticks in the three categories of evaluation (NEGATIVE, intermediate, POSITIVE) given in % of samples analysed.

CONCLUSIONS

Visual and reader analysis are in agreement for urinary concentrations to allow to exclude or to identify the presence of DOACs in urine.

- No differences of visual and reader analysis for the range of NEGATIVE results of DXI and DTI.
- Most concentrations of DOACs in urine are high and therefore POSITIVE.
- Few results are in the intermediate concentration range of DOACs in urine.
- Results differ between methods to less than 2% at intermediate and high concentration of DXI and DTI in urine.
- Both methods can be used to determine accurately the absence and presence of DOACs in urine.

CONTACT INFORMATION

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CONFLICT OF INTEREST

JH, FL: Managing director DOASENSE
RB, JBW, CW: consultancy fee
DOASENSE; JD, IE, MC, PV, SHR: none

REFERENCES


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