Force 3, Inc.

AF DDRS
Phosphor Storage Plate
Placement Guide

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Mitigating the Risk of Wrong Site Surgery Using Air Techniques Phosphor Storage Plates

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1.0 Background

On several occasions the question of incorrect Phosphor Storage Plate (PSP) placement and the ability to identify the incorrect placement using the orientation 'a' on the images has been raised. In an effort to clearly identify the problem and associated risk of a wrong site procedure, a series of exposures was taken to show the resultant images. Those exposures can be found in Section 3.0, Results.

2.0 Test Configuration:

A test setup was created using a Styrofoam bite tab and a large paper clip bent into the shape of the letter 'P'. For each exposure the 'P' was positioned so the point was to the anterior position. Plates were exposed simulating Right Upper, Left Upper, Right Lower and Right Lower horizontal exposures. For every location an exposure was taken for each possible orientation of the PSP plate. The four orientations in sequence were:

1) Plate correct – Phosphor side to tube head ('Text to Tongue') and the orientation 'a' toward the occlusal plane
2) Plate backward – Phosphor side away from tube head and the orientation 'a' toward occlusal plane
3) Plate correct, upside down – Phosphor side to tube head and the orientation 'a' away from occlusal plane
4) Plate backward, upside down – Phosphor side away from tube head and the orientation 'a' away from occlusal plane

For the purposes of this paper we will only use the plate correct and plate backward exposures for the Right Upper and Left Upper positions. For reference, of all the exposures are included at the end of this document.

Front and rear photographs of the test setup for each exposure position are shown in Figures 7-14.

3.0 Results

The resulting images clearly show that an x-ray of a Right Upper tooth (Figure 2) where the plate is placed with the Phosphor side away from the tube head (plate backward) will appear as if the x-ray was correctly taken of a Left Upper tooth (Figure 4). When the Phosphor plate is exposed with the 'sensitive' side facing away from the tubehead, an image is still recorded on the phosphor through the back of the plate. When the plate is scanned with the ScanX, the image is still read from the phosphor or 'sensitive' side of the plate. Since the phosphor side of the plate was facing the opposite side of the mouth when the exposure was taken, the resulting image will have the orientation 'a' located as if it was taken on the opposite side.

Figure 1

Figure 2

Figure 3

Figure 4

The illustrations below provide an understanding of how a plate exposed from the back side will result in an image which will appear to be exposed from the opposite side of the mouth. In Figure 5 the correct positioning of the plate is shown. The x-ray source places the image on the plate from the same side it is read by the ScanX. Figure 6 shows incorrect positioning where the image is placed on the phosphor through the back side of the plate. The image is still read by the ScanX from the phosphor side. Note that in both of the diagrams the orientation 'a' is in the same location and the plate is read from the same direction.

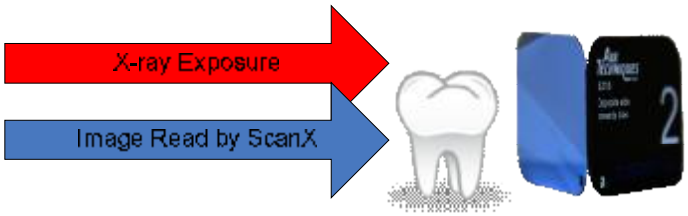


Figure 5
Correct exposure

Figure 6
Incorrect exposure

4.0 Summary:

With the current PSP plates there is no definitive method to determine when a plate has been exposed with the phosphor side away from the x-ray tube head. The only way to prevent this is for the technician to be absolutely certain the text printed on the back side of the PSP plate is visible inside the patient's mouth ('Text to Tongue') before they take an exposure. It is imperative that this is discussed and demonstrated during our training process as Digital Dental Radiography is deployed throughout the Air Force.

Photographs Showing the Test Setup

Figure 7

Figure 8

Exposure #1 - Right Upper setup showing proper placement of Phosphor Plate, text to tongue and sensitive side to x-ray source

Figure 9

Figure 10

Exposure #2 - Right Upper setup with plate backwards – Sensitive side away from x-ray source

Figure 11

Figure 12

Exposure #5 - Left Upper setup showing proper placement of Phosphor Plate, text to tongue and sensitive side to x-ray source

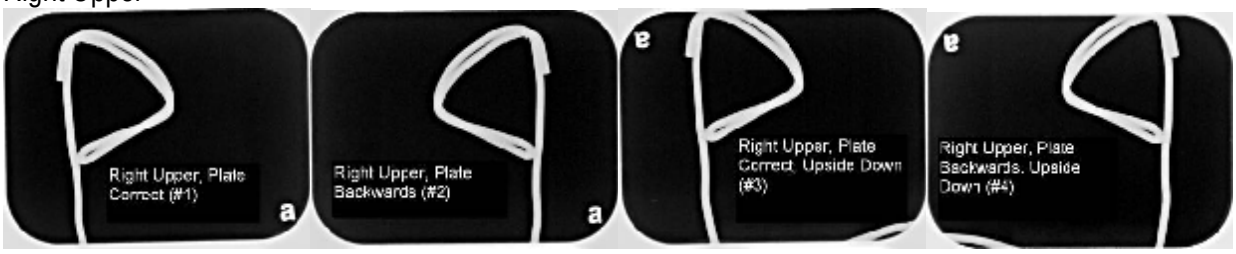
Figure 13

Figure 14

Exposure # 6 - Left Upper setup with plate backwards – Sensitive side away from x-ray source

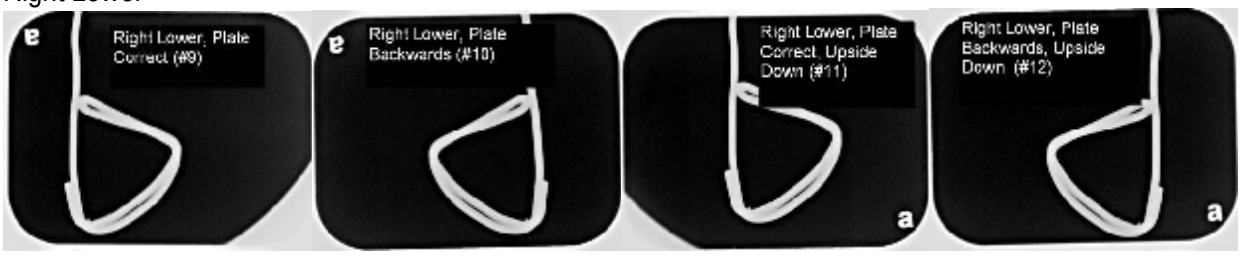
Images from All Test Exposures

Right Upper



Left Upper

Right Lower



Left Lower