Letter to the Editor:

Simulated Fluoroscopy

There has been a lot of progress in the field of Pain Management and one of the most recent is the introduction of the contralateral oblique (CLO) view. It is another opportunity for Pain Practitioners to provide quality care to their patients, when conventional views: anterior posterior and lateral are not sufficient or simply are not obtainable, such as when shoulders obstruct the lateral fluoroscopy of the lower cervical region [1-3]. However, the practitioner who is not familiar with CLO fluoroscopy and wants to employ it, needs to understand how the image presented on the monitor changes with needle location in relationship to the cervical spine and with the different angles that are used to achieve the CLO view. Reading literature on the subject, learning from images obtained in the procedure room, and training at a cadaver lab would allow one to eventually master and comprehend different fluoroscopic views. But is there a way to help one through this process?

Given the task of explaining the concept of CLO fluoroscopy to my colleagues, I came up with the idea of light and shadow presentation (patent pending). There are many similarities between fluoroscopy and light and shadow effect. Light and X-rays are the energies that penetrate objects; they penetrate different objects differently. Soft tissues are transparent with fluoroscopy, while hard matter such as bones or needles are less transparent and would be seen on the monitor. Only a few objects are transparent with light, such as clear glass, plastic, or rubber, while most matter is not transparent and would create a shadow. The density of the shadow would vary with the transparency of the subject that reflected on the shadow; they could be collected and seen as an image by the accepting objects. For example, light reflected on the wall or screen is seen as a shadow; or X-rays collected by an image intensifier are converted and then projected at the monitor as an image.

So the idea of my presentation was to:

a. Explain different fluoroscopic views;

b. Explain different landmarks such as the spinolaminar line and the ventral intralaminar line;

c. Illustrate how different needle positionings in relationship to midline would affect shadows on the wall, or images on the monitor.

To fulfill the task I created a video: “Simulated Fluoroscopy Presentation.” Please watch it on YouTube [6].

I used a plastic transparent bottle as a model for my presentation. One may use any transparent object. I referred to the model as a “Ventral Space” and will explain why later. There are radiological landmarks that a practitioner needs to know while performing epidural access with fluoroscopy: the spinolaminar line (SLL) and the ventral interlaminar line (VILL). The SLL is a line seen on a lateral radiograph that is formed by the junction of the two laminae with the corresponding spinous process [4]. It is in the middle of the spine at the anterior posterior view and in my presentation I identified it as the midline. “VILL is the hypothetical line that connects the ventral margins of the laminae and is a line that one is interested in when attaining interlaminar epidural access employing the CLO view” [5]. However, if there is a VILL then there is a ventral intralaminar space. In my presentation I described it as a space that outlines a spinal canal, or ventral, to the laminar at the back, pedicals at the side, and vertebral bodies and disks in the front. This space includes “epidural space, dura, the spinal cord, and all the layers” [6]. It is important to know that your needle is near the ventral space to avoid penetrating the ventral space too deeply.

In the presentation I explore three scenarios:

1. Needle tip touching model or “ventral space” at midline;

1. Needle tip touching “ventral space” lateral from midline at the site of needle placement;
2. Needle tip touching “ventral space” lateral from midline on the site opposite from needle placement.

With each scenario I explore a shadow on the wall with lateral and contralateral oblique views and verbalize findings as: needle tip is by the edge of the shadow, or needle tip is too deep inside the shadow. While gathering information for this article I collected fluoroscopic images of lateral and CLO views that illustrate the same scenarios as in the video presentation (1, 2 and 3), so I could compare the results of the light and shadow presentation and real fluoroscopy, but then changed my mind. I prefer, if you, a reader of this article, will prove or disprove the findings of the YouTube video.

How does one obtain the correct angle for a CLO view? How does the depth of the needle on the monitor change with a different C-Arm angle and with different needle positioning in regard to the midline? Which fluoroscopic view is preferable with different needle locations? These questions are difficult to answer, but easy to illustrate with light and shadow presentations. A model for light and shadow presentation is easy to create and a pleasure to play with. It could enhance the educational process for those students, residents, fellows, and interventionists who want to know more on the subject and to be safe with their procedures.

References

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4 Matar LD, Helms CA, Richardson WJ. “Spinolaminar breach”: An important sign in cervical spinous process fractures. Skeletal Radiol 2000;29(2):75-80.

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6 Perper Y YouTube video: “Simulated Fluoroscopy Presentation.” http://youtu.be/kYxwmcA2fsM