Forensic Investigation Research Station

Technical Manual Series

Skeletal Photography Protocol

FIRS Technical Manual 8
Second Edition

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FIRS Skeletal Photography Protocol

Skeletal photography is an important part of any forensic anthropological analysis. The overview photos are a record of the skeletal elements present. Detail photos comprise a visual record of the pathology, trauma, and taphonomic changes seen on the skeleton and demonstrate findings of the analysis.

This manual is designed to give an overview of the important photographs to document a skeleton as well as basic tips to take high quality photographs.

DSLR Cameras and Camera Accessories

A DSLR camera is a digital single-lens reflex camera, meaning that it is a digital camera with a mirror in the that reflects light from the lens into an optical viewfinder. This type of camera is a standard choice for technical photography.

DSLR cameras have a variety of settings that can be useful in skeletal photography. Successful photographs can be taken in the auto setting by carefully adjusting the lighting, though it is generally more effective to set the camera to a partial or fully manual setting. This allows greater control of the exposure and depth of field, both of which can greatly impact the quality of the final photograph. While this manual will discuss tips to control exposure and depth of field, instructions to access settings on the camera will not be covered as this can vary greatly between camera brands and models.

In addition to the camera, a tripod, lights, and an external flash are recommended tools for skeletal photography. Again, they allow for greater control over the final photograph and make the overall process far easier.

Other Tools and Accessories

Other useful accessories include a skull rest, small beanbags, a soft-sided light box, dark background material, scales, and scale holders (Fig. 1). More elaborate lighting set ups can be useful, though are not necessary.

Use the skull rest to keep the skull or other skeletal element stationary during photography. Skeletal elements can be rotated on the holders to improve the angle. Beanbags are a soft surface for bones that both provide support and prevent damage. These tools help secure skeletal elements in the desired position for the photograph.

A light box softens lighting when using the external flash or additional lights, reducing hard shadows. A dark background can aid with this by creating contrast between the background and the bone.

Scales and holders help to show the proportions of bones. An appropriately sized scale makes it easier to have both the object and the scale in focus. For best focus, place the scale level and in the same plane as the photo's subject. The scale may be placed next to the subject or in a holder. Scale holders allow the user to adjust the height and angle of the scale and secure it in place.

Figure 1: Selected useful tools and accessories.

Osteology Photographs

The skeleton is documented through a few key types of photographs: overview, mid-range, close-up, and specialty photographs. Through the course of this process all bones are photographed and all noteworthy variation (pathology, trauma, taphonomic damage) is documented. While many of these photographs primarily serve to document the skeleton, others can be invaluable tools to illustrate the findings of an analysis.

Overview Photos

The overview photo documents the entire individual in a single frame. Ideally this is taken from above and perpendicular to the remains, though this angle can be challenging to achieve. If this angle is not possible, position the camera as close to the correct angle as is reasonable. Avoid having objects in the background by clearing the space and framing the photograph tightly around the skeleton (Fig. 2).

For this photo, place all present elements of the skeleton on a table as close to anatomical position as can be achieved. If the table is not long enough, elements can be placed side by side as needed (Fig. 2). All elements should have enough space around them to be clearly differentiated in the photo.

To light the overview photo, place lights on opposing ends of the table. If possible diffuse the light by shining it through white paper, cloth, or other material. This set up can help light the skeleton and minimize harsh shadows. If additional lights are not available, standard ceiling lights can light the skeleton sufficiently.

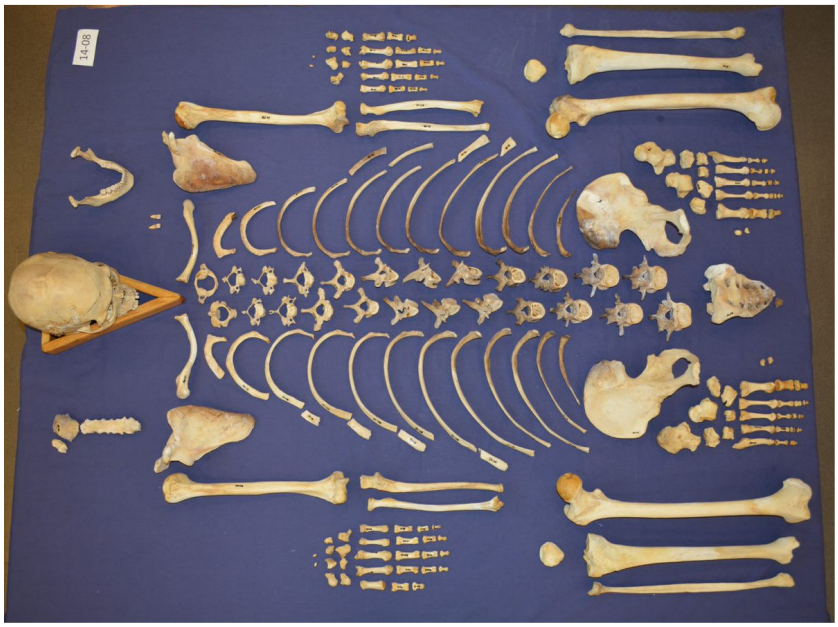

Figure 2: Example of a good overview photograph.

Mid-view Photos

Mid-view photographs contain a group of bones that are anatomically close to each other (Fig. 3). This is not needed in all sections of the body but can be particularly useful for groupings of many bones, such as hands or feet. Mid-view photos can also present the pattern of a pathology or trauma in a section of the body, such as joint replacements or fractures reflected in adjacent bones.

Figure 3: Mid-view of right arm.

Close-up Photos

Each bone in the skeleton is photographed in a series that includes the superior, inferior, anterior, posterior, medial, and lateral side of the bone (Fig. 4). This is designed to clearly document every surface of the bone from standard angles. Once all six photos are taken, they are then repeated using an appropriately sized scale.

Figure 4: Close-up photos of a radius.

Pathology, Trauma, and Variation

If variation is present in a bone or section of the skeleton, additional photographs are needed to document this. For example, the femur in Figure 5 has a hip replacement. In addition to the standard close-up photos, a mid-view photo including the pelvis and close-ups of the implant (Fig. 6) document the replacement.

Other changes that may call for additional photographs include, but are not limited to: trauma, taphonomic breaks, significant weathering, scavenging, and developmental variation.

Figure 5: Reference photo for showing overall location of the hip replacement.

Figure 6: Close-up of the hip replacement.

Analysis Related Photos

Additional photographs can be useful to support the findings of a skeletal analysis. While most of this is covered through the documentation photographs, additional photos are useful. For example, if the analysis included age estimations based on the pubic symphysis and the auricular surface, these areas should be specifically documented (Fig. 7).

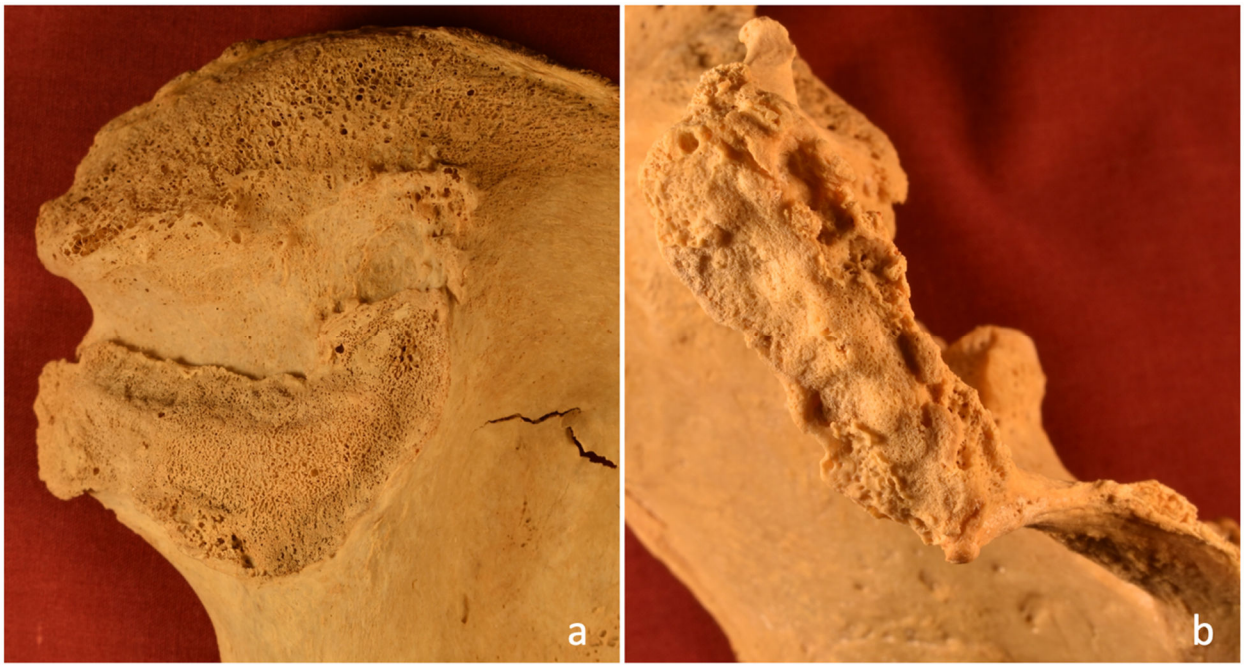

Figure 7: Close-up photos of the auricular surface (a) and the pubic symphysis (b).

Tips and Tricks

The most challenging aspect of skeletal photography is sufficiently capturing the detail of the bone. This can be achieved by correctly lighting the bone (through both exposure and angle) and optimizing the depth of field for the desired subject. This section addresses ways to accomplish this.

Depth of Field

Depth of field refers to the distance between the closest and farthest points in the frame that are fully in focus (Fig. 8). For all photos described in this manual, the part of the bone being photographed must fall between these two points. For photos that include a scale, the scale must also fall in this range.

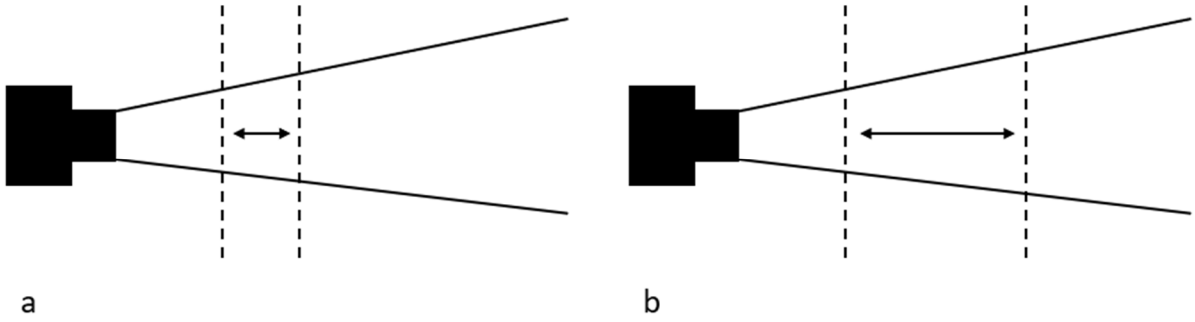

Figure 8: The depth of field (area in focus) is represented by the area between the dotted lines. (a) Shallow depth of field with a larger aperture or smaller f-stop. (b) Deep depth of field with a small aperture or relatively high f-stop. Illustration by A. Smith.

Depth of field can be changed by adjusting the aperture, or the size of the opening that light is allowed to pass through when the shutter opens. The smaller the opening, or aperture, (e.g., the larger the f-stop), the greater the depth of field (Fig. 9). However, this decreases the amount of light coming into the camera. To account for this, decrease the shutter speed and used additional lights. When decreasing the shutter speed significantly, a tripod is essential to prevent small movements that will blur the photograph. Put the camera in manual or aperture priority settings to control the aperture.

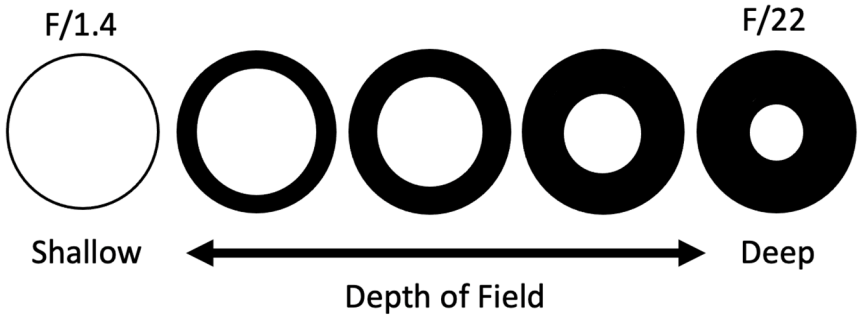

Figure 9: Aperture size compared to depth of field. Smaller aperture (higher f-stop) creates a greater depth of field. Illustration by A. Smith.

Lighting

Oblique lighting occurs when the light source is positioned at a low angle relative to the lens. This creates shadows on the surface of the bone that show detail not originally visible to the camera. When using oblique lighting, particularly in combination with manual settings, it is easy to over- or underexpose part or all of the bone (Fig. 10).

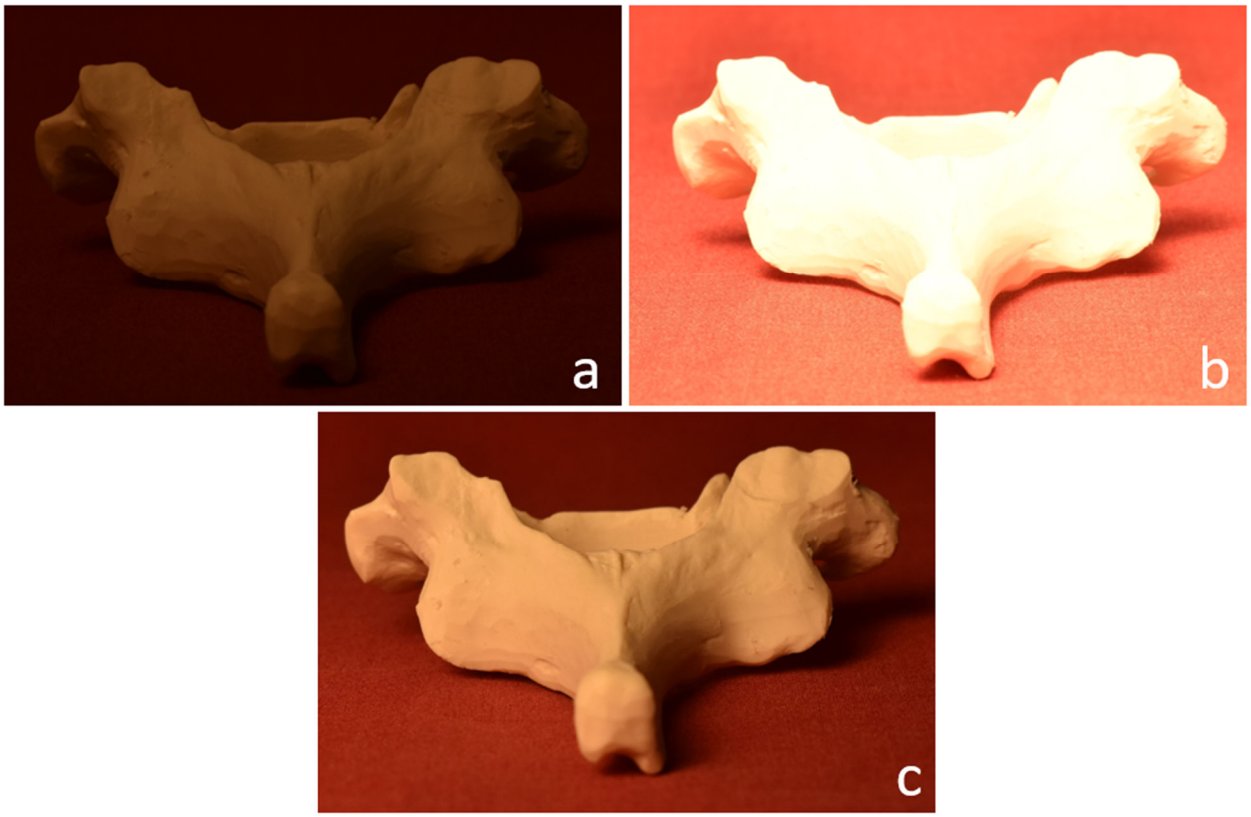

Figure 10: Underexposed photograph (a), an overexposed photograph (b), correct exposure (c).

A light box can help to defuse harsh lights, making it easier to get useful shadows without over- or underexposing the bone. Use of a dark background can create contrast, making it easier to light the bone correctly.

Post-processing

Once the photos are transferred to a computer, converting them to black and white may increase the contrast and emphasize soft shadows, making details, pathology, and trauma more visible. However, this will also remove color variation, which can provide information about taphonomic changes such as weathering and staining. So, while this can be valuable in some cases, not all photos benefit from post-processing.

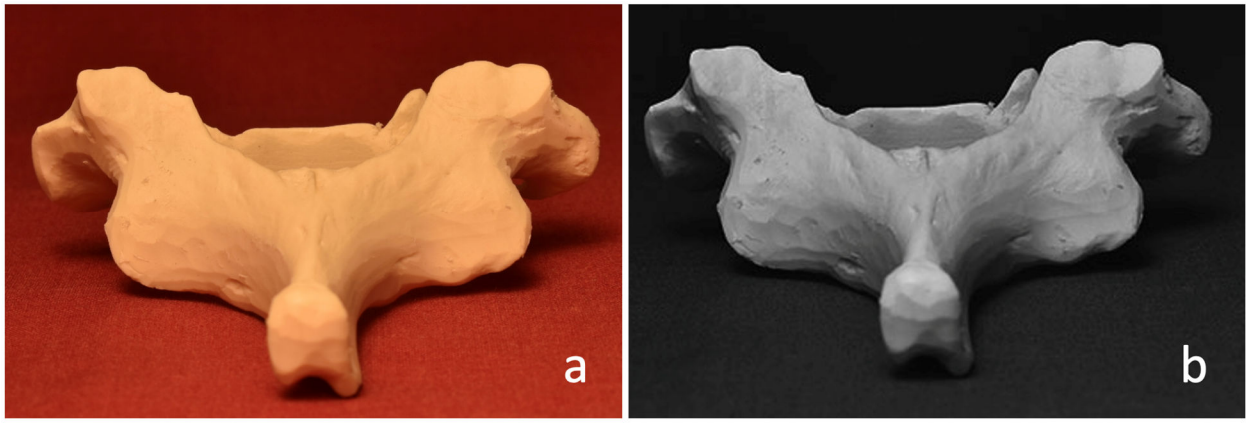

Figure 11: (a) Initial photograph and (b) same photo, converted to black and white.