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A SIMPLIFIED METHOD OF ATTACHING ACCELEROMETER PACKAGES TO BONE

By

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Experimental studies in impact biomechanics often require the rigid fixation of accelerometers to specific bones. Some of the existing techniques involve considerable dissection and damage to supporting soft tissues. Thus, the mounting procedure may affect the accuracy of the results. Gregerson and Lucas (1967) studies spinal rotation by inserting a Steinmann pin into the spinous process of vertebrae. The technique described in this note utilized this pin and provides a rigid mounting platform without any dissection.

Threaded Steinmann pins are readily available in sizes from approximately 0.7 mm to 5 mm in diameter, from any orthopedic supplier. Using x-ray control, it is possible to insert two threaded Steinmann pins into almost any bone. An accelerometer package can then be fixed to the pins. The attachment of a nine accelerometer package to the first thoracic vertebra of a human cadaver is described. However, this method can be easily modified for long bones, ribs, other vertebrae and the skull.

A radio opaque marker is placed on the skin as shown in Figure 1. X-rays are taken in two planes at right angles to determine the exact location of the marker. A P-A view of the thorax with a marker in place is shown in Figure 2. Using the marker as a guide, it is then possible to percutaneously insert a threaded Steinmann pin of appropriate diameter into the lamina of T-1,* as shown in Figure 3. The position is then checked

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*Until one becomes comfortable with the technique it is recommended that a small wire be inserted into the spinous process of T-1 to ascertain its position on x-ray.

on x-ray. The accelerometer mount is placed over the wire and used as a template for the insertion of the second Steinmann pin, as shown in Figure 4. The final location of the mount is documented on x-ray. The P-A view is shown in Figure 5.

Figure 6 summarizes the technique. It is an exploded view of the entire assembly. The holding strength of the Steinmann pins was tested by lifting the cadaver by the mount, as shown in Figure 7. This technique can be easily applied to any bone for the fixation of accelerometers or any other transducer.

REFERENCES

Gregerson, G.G. and Lucas, D.B. (1967) An In-Vivo Study of Axial Rotation of the Human Thoracolumbar Spine. J. Bone and Joint Surg., 49A:247-262.

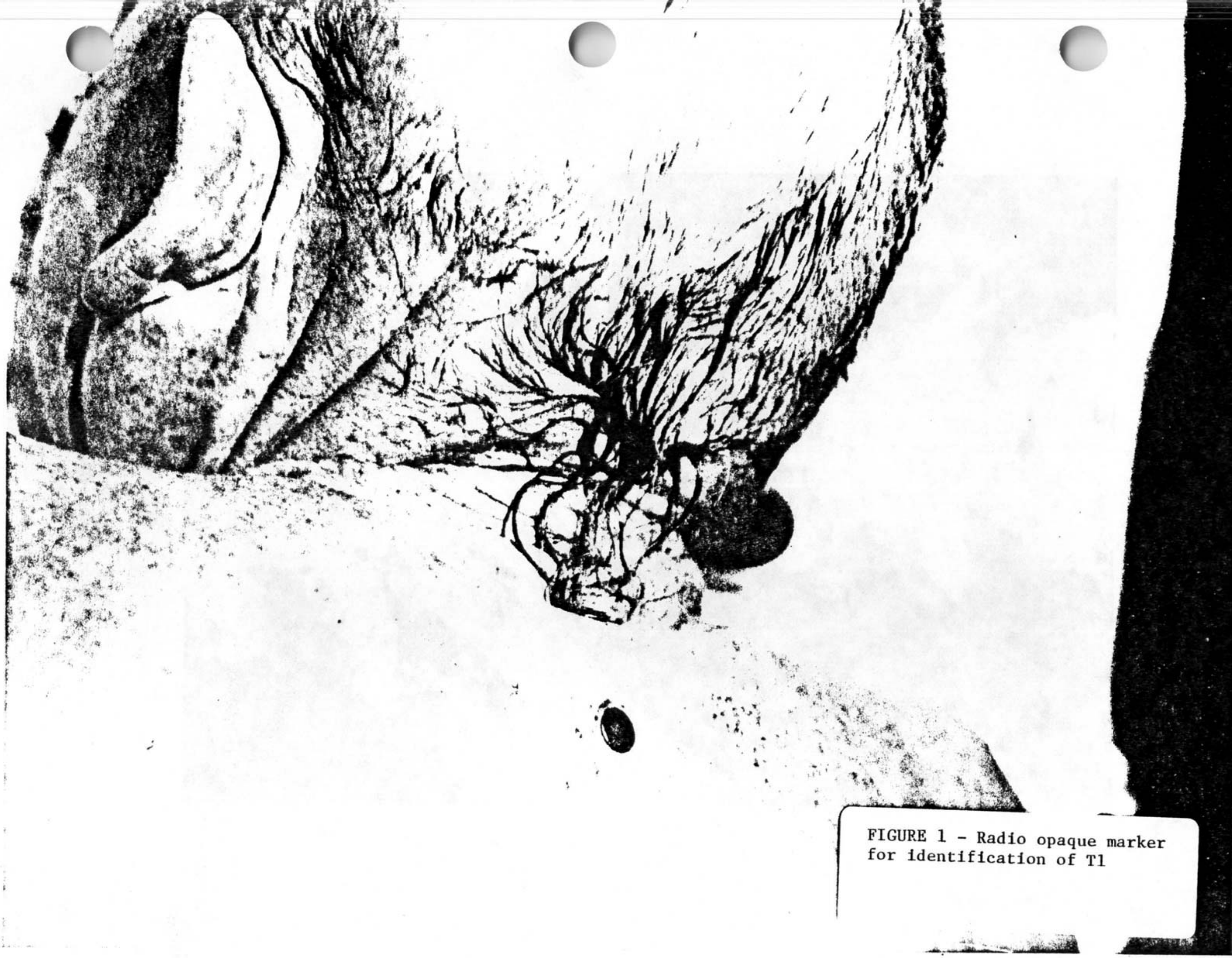

FIGURE 1 - Radio opaque marker for identification of T1

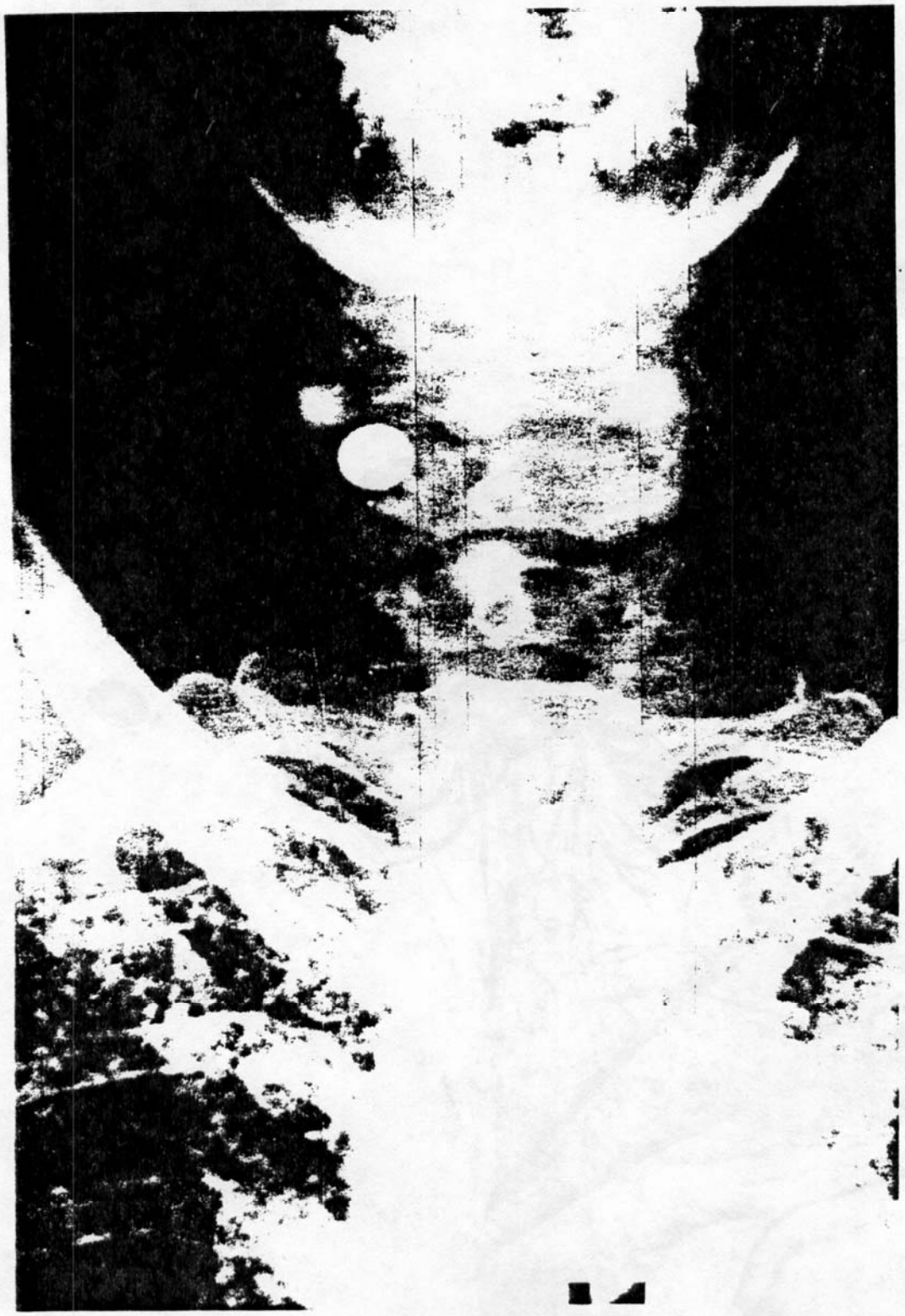

FIGURE 2 - P-A x-ray of the thorax with marker in place

FIGURE 3 - First Steinmann pin being inserted into the lamina of T1

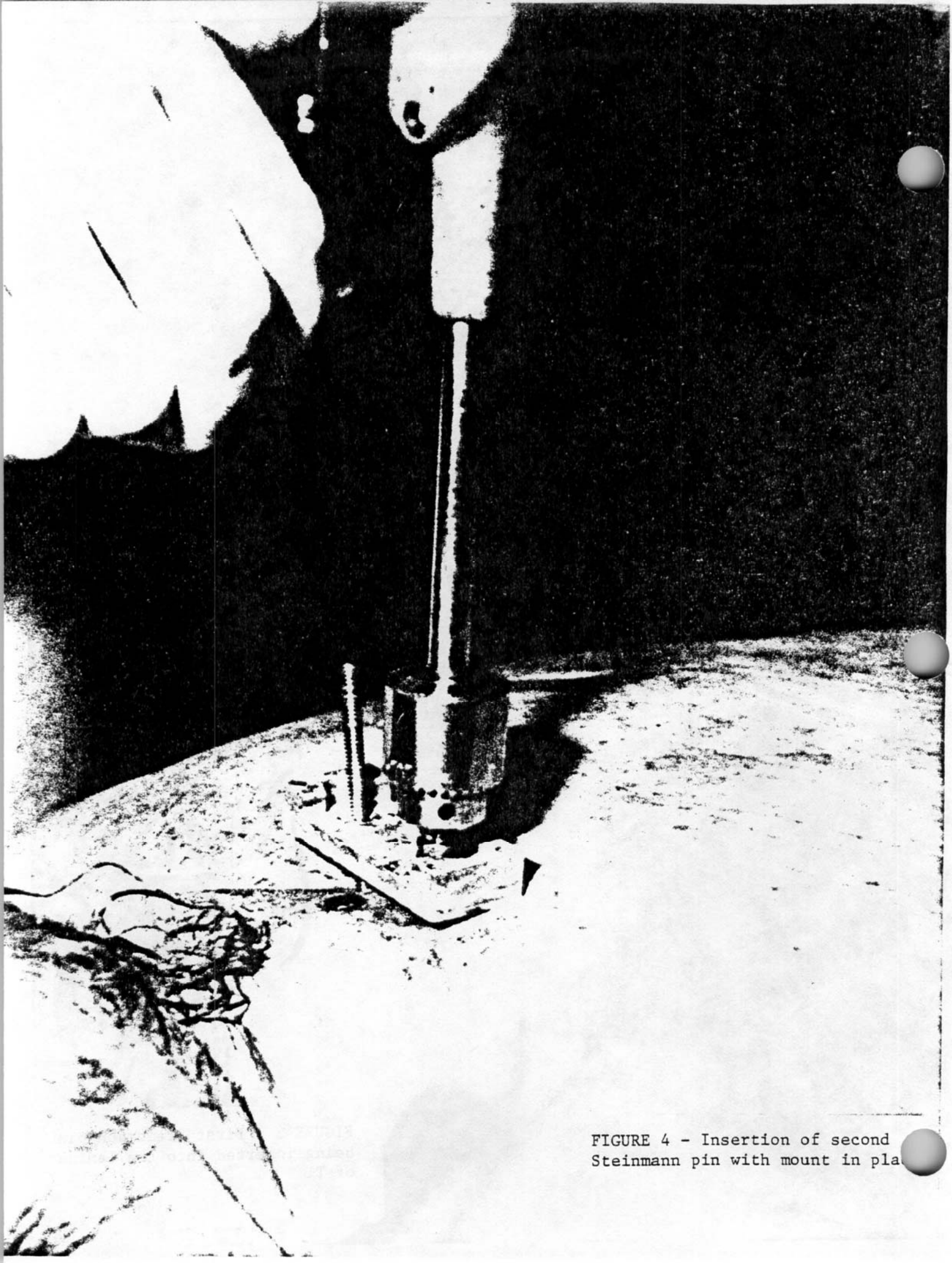

FIGURE 4 - Insertion of second
Steinmann pin with mount in pla

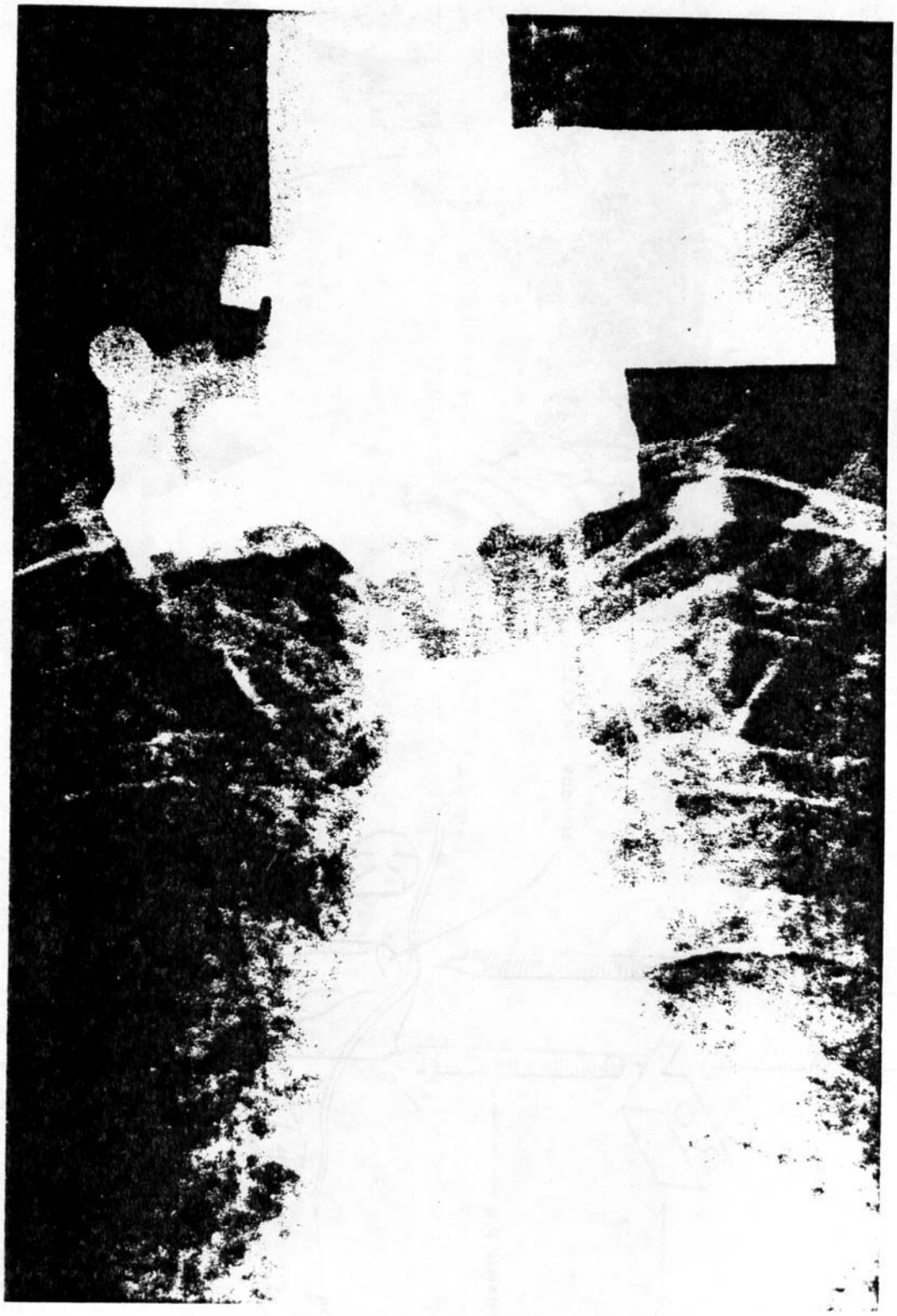

FIGURE 5 - P-A x-ray of thorax
with Tl mount in place

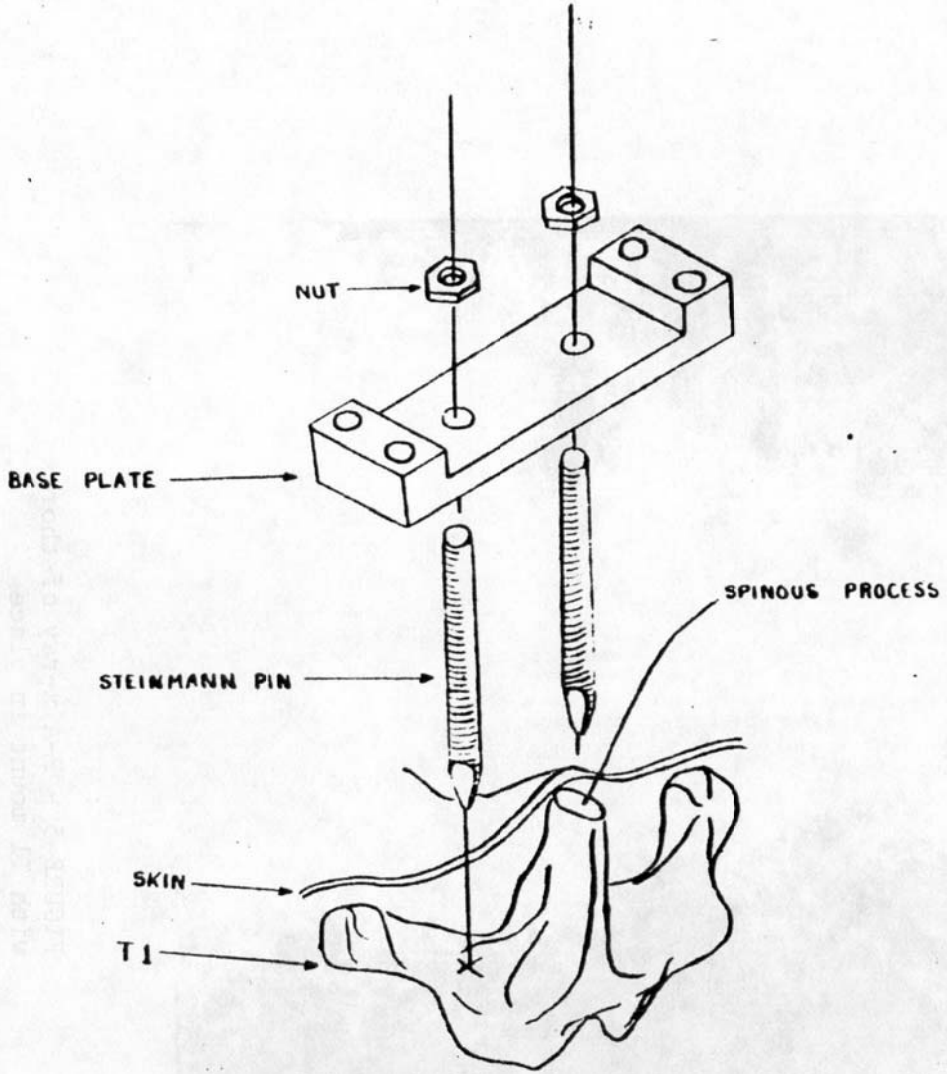

FIGURE 6 - Exploded view of accelerometer mount

FIGURE 7 - Cadaver being lifted via the T1 mount.