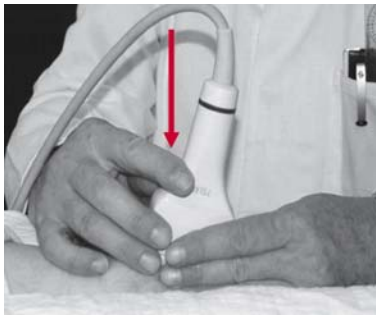
# 12 Errors Due to Tilting the Probe



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Because of the different speeds of the ultrasound beam in the tissues, there is diffraction and refraction of the ultrasound waves which depends on their angle. These can distort the image. Research has shown that an oblique ultrasound beam, as produced by sector scanners and also where the transducer is tilted (linear transducer), can lead to serious errors in diagnosis. It is therefore essential to make sure that the transducer is straight when it is placed on the baby.

## 12.1 Antero-posterior Tilting

In these circumstances a sonogram similar to that of the standard section is produced. However, correct identification of the osseous rim in order to delineate the base line is barely possible because of the poor definition of the perichondrium and of the ilium. At the same time the lower limb of the os ilium cannot be clearly depicted but a "fading echo" leads to false delineation of the acetabular roof line.

## 12.2 Postero-anterior Tilting

Here the sectional plane appears to be posterior. To the surprise of the examiner, this posterior plane does not disappear even when the transducer is turned anteriorly. Because the curvature of the os ilium does not change, the examiner uses one of these images for the final assessment because it is not possible to get a better scan section. The examiner assumes falsely that this is a normal variant with a raven-like extension of the osseous rim.

## 12.3 Cranio-caudal Tilting

In this case the lower limb of the os ilium is usually not clearly seen. Poorly defined fading echoes of the lower limb result.

## 12.4 Caudo-cranial Tilting

This is probably the most serious of all the mistakes that can lead to important misdiagnosis. In caudo-cranial tilting, the errors add up.

By tilting the transducer the mid part of the acetabular roof looks as though it is the posterior section. The examiner now turns the transducer more anteriorly, because he assumes that he is too far posterior, until an apparent mid sectional plane appears on the monitor. In fact the ultrasound plane is now in the anterior section of the acetabular roof. With this tilting error the bony socket worsens.

Because of the great difference in the ultrasound speed in hyaline cartilage, soft tissue and bone, the diffraction and refraction phenomenon is intensified because of the tilted ultrasonic waves. This causes distortion of the image.

Because of the summation of the errors due to diffraction and refraction of the tilted ultrasound beam and the incorrect identification of the section of the acetabular roof, a normal hip joint can be made to look decentred.

The tilting effect can be identified by characteristic alterations in the landmarks. By strictly observing the criteria of the so-called usability test, useless sonograms can be discarded. If one considers the most serious of errors, the caudo-cranial tilting, inexperienced examiners can sometimes find it difficult to detect this distortional error. In this case the epiphyseal plate of the femoral neck can help. If the ultrasound waves come caudo-cranially, the osteochondral junction (epiphyseal plate) of the femoral neck is no longer seen, at least not in its typical shape. This chondro-osseous junction is not relevant for