A-Scan Tips and Techniques

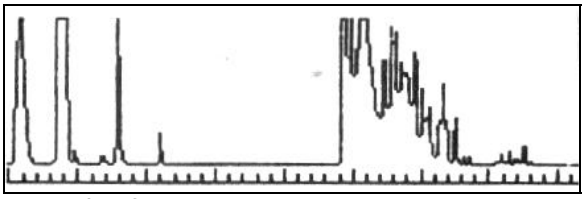
There are a few common errors that may occur when performing A-scans which deserve some mention. These errors are described below.

A-Scan Echo Patterns

Recognizing an optimal echo pattern is the basis for performing accurate A-scan measurements. Even when using one of the automatic scan capture modes, the user should review each scan to determine whether or not the scan pattern is acceptable. It is important to remember that the automatic modes are meant to facilitate the examination procedure, but not replace the examiner's clinical judgment. The examination results should not be blindly accepted and by reviewing the scans the user will reduce the possibility of any errors which may cause less than optimal results. In reviewing, the user should compare the similarity of the characteristics of the particular scan under consideration with those of an optimal A-Scan pattern.

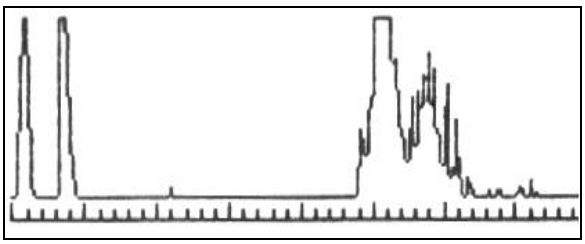
Characteristics of an optimal A-scan are as follows:

1) The cornea, lens and retinal echoes should all be approximately the same height.



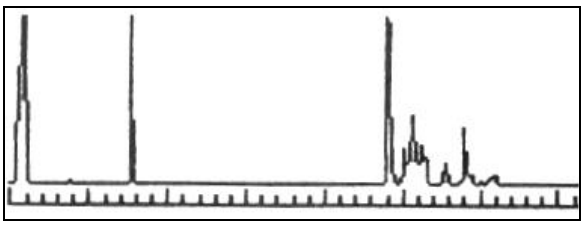
Example of Correct A-Scan Pattern

2) The retinal echo should rise sharply from the baseline forming a 90º angle.



Example of Poor Retinal Rise

3) The orbital pattern beyond the retina should present a gradual decline. A sharp drop in this pattern may indicate that the probe is not aligned along the visual axis.



Example of Poor Retinal Decline

The user should always strive to achieve these three basic criteria before accepting any measurements as accurate. Some anatomical variations may prevent all such criteria from being simultaneously achieved in any given scan. In such a case, a scan may have to be accepted based on its meeting the remaining criteria.

Examination Mode

Before performing an axial length measurement the user should always verify the operating mode (cataract, dense cataract, aphakic, pseudophakic, or manual). Since this mode governs the manner in which the instrument evaluates an A-scan pattern and the parameters the instrument utilizes in its calculations, mistakes and/or large numerical errors can occur if the incorrect mode is selected (even though A-scan pattern appears satisfactory).

Corneal Compression

One of the most common mistakes made when performing axial length measurements is applying excessive pressure on the eye with the probe. When using a direct contact probe it is possible to indent the cornea to the extent that the measurements will be adversely affected, namely shorter than actual measurements will be taken. Additionally, variability between scans can be introduced if inconsistent pressures are used.

Some of the steps that can be taken to reduce the impact of corneal compression include:

- In performing direct contact scanning, extreme care should be taken to ensure that only enough force necessary to maintain contact with the cornea is used.

- Corneal compression can be minimized to some degree by using Sonomed's Soft-Touch probe, since excessive pressure is evidenced by the fact that the probe will begin to recede into its housing. As a result less pressure is transferred to the cornea and less compression will occur. All Sonomed A-scans come with choice of a standard or Soft-Touch probe.

- Variability between scans can be mitigated by checking the measured ACD values listed in the Measure Scan screen for any inconsistencies. This will generally indicate whether or not there is excessive corneal compression that requires deleting that particular scan from the group.

- To eliminate all concerns regarding corneal compression, the immersion scanning technique can be used in which a small immersion scleral shell is placed onto the eye between the lids, filled with BSS, and the probe immersed into the fluid without contacting the cornea. The BSS acts as an ultrasonic coupling media, allowing scans to be taken without contacting or compressing the cornea. The Sonomed PacScan and EZ-Scan both offer the ability to perform either direct contact or immersion scanning, and Sonomed provides the Prager Shell for optimum immersion scanning.

Immersion Technique

Although use of the immersion technique completely eliminates corneal compression as a complicating factor, and can greatly assist with the alignment of the probe with the macula, it is still necessary to review and analyze waveforms to ensure an acceptable reading.

The probe must be properly positioned within the immersion scleral shell in order for the system to automatically capture the waveform. If a seemingly proper waveform is not automatically captured, check to see whether the leading edge of the corneal echo is either inside or outside the limits of the corneal window. In either instance a warning message "POOR CORNEA" will be displayed.

Only scans with a steeply rising retinal spike should be accepted. A minor "stair-stepping" is inherent in a digital waveform, but a reading which is registered on a third or higher step should not be accepted. In other words, the horizontal threshold line (which is the "reading" line) should cross on the first or second vertical step of the retinal spike. Additionally, the retinal spike should be "stepped" only by the thickness of a single line – scans with additional lines should be rejected.

There should also be a strong scleral spike, about 1.5 to 2.0 mm posterior to the retinal spike. The scleral spike amplitude should be close to that of the retinal spike, and can be slightly lower or higher.