CineScan S

with

POWERFUL NEW HARDWARE & SOFTWARE

for

STANDARDIZED ECHOGRAPHY

With the advent of significant technological advances in both hardware & software, all of which are realized in the new Cinescan-S instrument, **Standardized Echography has become much easier, quicker and user-friendly for the operator and less demanding on the patient.**

The **new software** for Standardized Echography has been developed in collaboration with Karl C. Ossoinig, MD, Professor Emeritus of the University of Iowa Medical School, who had previously designed and developed the criteria of Standardized Echography while director of the Ophthalmic Echography Services at the University of Vienna (Austria) and Iowa (USA).

The following gives a brief overview of some of the unique A-scan diagnostic capabilities, which together with advances in B-Scan technology mark the **superior performance of the Cinescan-S instrument**. All examples are taken from Dr. Ossoinig's extensive teaching materials.

Regular courses and workshops are organized on Standardized Echography throughout the world. Please do not hesitate to ask us for further details on the next course nearest to you.

1) AUTOMATIC TISSUE SENSITIVITY DETERMINATION

Tissue Sensitivity determination, once a time consuming operation, is now automated. A new and quick procedure averages 10 consecutive measurements and calculates the final results in seconds.

2) THE CINELOOP REVOLUTION

CINELOOP

While A-scan optimization is of primary importance when performing the examination, even skilled echographers may have to repeat the procedure to achieve the maximization of the surface signals. The Cineloop feature of the A-scan records up to 4 seconds of examination once the optimal pattern has been detected and "frozen" by the operator. This four-second sequence (representing up to 200 echograms) can either be played frame by frame or viewed continuously as a video. This same function is available in the B-scan mode (records up to 39 B-scan images). Both are designed to significantly reduce exam time for both the operator and the patient.

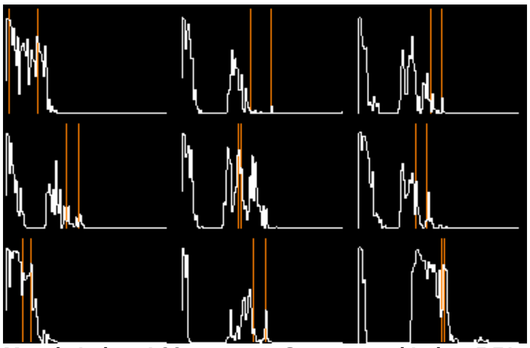
This **Cineloop** has **great value for B-scan**; but **for A-scan (Standardized Echography) it is invaluable** in significantly shortening and improving the examination. Additionally, the Cineloop feature greatly facilitates the **speedy and precise measurement of extraocular muscles, optic nerves, tumor sizes, and the optimal display of any tissue structures in eye and orbit.**

Figure 1 shows ***Orbital Profiles*** from the right and left eyes of a patient with Graves' orbitopathy and is utilized for the diagnosis, classification and management of this disorder. For this purpose, the apical sections in the four straight and the superior oblique muscles, and the belly section of the inferior oblique muscle must be measured with a sound beam aimed perpendicularly at the outer surfaces of the muscle sheaths in these sections. All measurements were obtained utilizing the Cineloop function saving up to 50% of the examination time which would have been otherwise required for these measurements.

FIGURE 1a:

Clinical Diagnosis: bilateral exophthalmus
Date: July/23/2002 **Eye: RIGHT**

Picture: Orbital Profile
#9 L.G. D=11.59 mm #2 S.R. D=8.14 mm #3 S.O. D=4.22mm
#4 L.R. D= 4.73 mm #7 O.N. D=1.28 mm #1 M.R. D=4.77mm
#6 I.O. D= 3.06 mm #5 I.R. D=4.84 mm #8 P.O. D=0.77mm



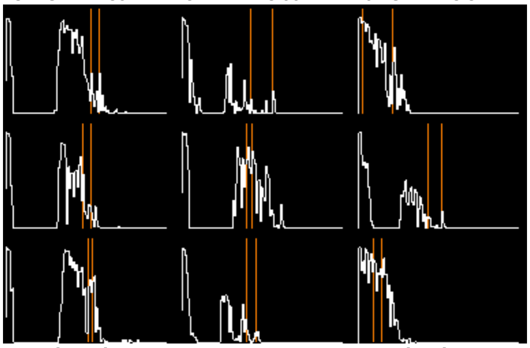
Muscle Index=4.96 **Superonasal Index=5.71**

Comments: Graves' orbitopathy GRADE I
Optic nerve neither compressed nor likely to be compressed soon - follow-up in 1-2 years

FIGURE 1b:

Clinical Diagnosis: bilateral exophthalmus
Day: July/23/2002 **Eye: LEFT**

Picture: Orbital Profile
#3 S.O. D=3.14 mm #2 S.R. D=8.60 mm #9 L.G. D=12.24 mm
#1 M.R. D=3.64 mm #7 O.N. D=1.90 mm #4 L.R D= 5.11 mm
#8 P.O. D=1.59 mm #5 I.R. D=3.99 mm #6 I.O. D= 3.37 mm



Muscle Index=4.64 **Superonasal Index=5.13**

Comments: same as in OD

The **software** of the Cinescan S instrument quickly **stores the results** of these measurements, calculates the ***Muscle Index*** (needed for the classification of grades I, II and III <mild, moderate and severe>) and the ***Superonasal Index*** (required for the classification of grade IV <optic nerve compression possible or even likely>) of Graves'orbitopathy [grade V <optic nerve compression> is determined through optic nerve measurements] and prints or transfers the profiles to a PC.

3) TRANSFER OF DOCUMENTATION TO PC

VISUSCAN

Visuscan is an optional software program (in WORD format) which allows the operator to quickly transfer patient exam records for both A-scan and B-scan to a laptop or PC. These records can be stored and recalled for comparison to future exams or emailed directly to a referring physician.

4) AUTOMATIC DISPLAY AND CALCULATION OF TISSUE REFLECTIVITIES

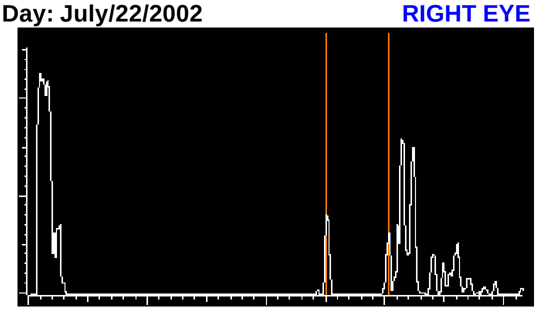
The evaluation of tissue reflectivity, one of the most important steps in tissue differentiation of ocular and orbital tumors in the **new Quantitative Echography I software** calculates a percentage of the average height of the inner tissue spikes. Tissue sensitivity setting is required for this examination. The sound attenuation, average height of inner spikes and lesion measurements are then automatically displayed.

Figure 2b shows the optimized tumor echogram (maximum height of surface signals indicating perpendicular sound beam approach at the tumor's maximum elevation). The optimized tumor echogram is quickly and easily recovered through the Cineloop function after it was recognized and "frozen" by the echographer. The low Measuring Sensitivity is preferable for documenting the optimal tumor echogram as the sound beam is narrow (quasi focused), the ultrasonic pulses are shorter and the portion of the S-shaped amplifier curve utilized is steeper.

FIGURE 2b:

Clinical Diagnosis: choroidal tumor

Day: July/22/2002 **RIGHT EYE**



Gain: **T-24.5dB**
Velocity(m/s): 1550 **Distance: 4.03 mm**
AVG Height= 0%

Comments: maximal elevation = 4.03 mm

VARIGAIN - GAIN VARIATIONS AFTER FREEZING OF ECHOGRAMS

The Varigain function allows the operator to quickly adjust the gain after an A-scan (or B-scan image) is frozen, an additional feature to reduce both B-scan and Standardized Echography examination time.

The operator can change quickly from Measuring Sensitivity to Tissue Sensitivity for the documentation of tissue reflectivity, even after the echogram was frozen (Figure 2b → Figure 2c).

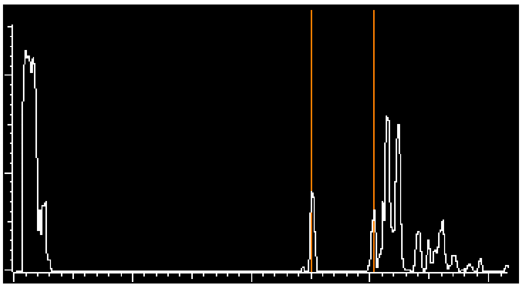
FIGURE 2a:

Clinical Diagnosis: Choroidal Tumor
Day: July/22/2002 RIGHT EYE

10 MHz B-scan T10EP G=92dB DYN=60dB TGC=0dB
Comments: intraocular tumor with retinal detachment; suspicious of MM

FIGURE 2b:

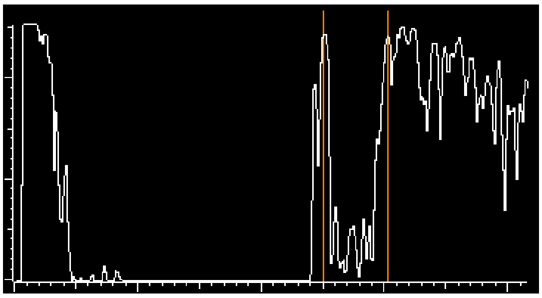
Clinical Diagnosis: Choroidal tumor
Day: July/22/2002 RIGHT EYE



Gain : T-24.5dB
Velocity(m/s): 1550 Distance: 4.03 mm
AVG Height= 0%
Comments: maximal elevation = 4.03 mm

FIGURE 2c:

Clinical Diagnosis: choroidal tumor
Day:July/22/2002 RIGHT EYE



Gain:
T= Velocity(m/s): 1550
Distance: 4.03 mm
Comments: choroidal malignant melanoma

5) AUTOMATED DIAGNOSTIC SUPPORT: RECOGNITION of SPECIFIC REFLECTIVITY of RETINAL SURFACES (Retinal detachment versus dense fibrovascular membranes)

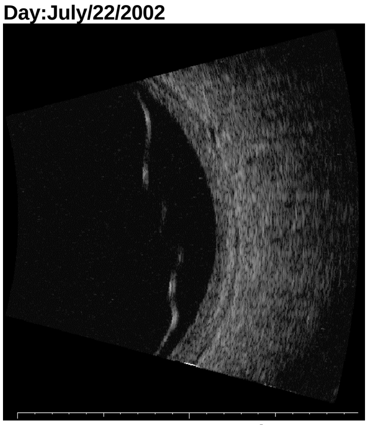
The differentiation between detached retina and dense fibrovascular membranes in eyes with opaque ocular media is often a great challenge to the echographer, especially in cases of severe diabetic vitreo-retinopathies or severe ocular trauma. Certain B-scan criteria can be very helpful in making this differentiation, but in less than 40% of the cases lead to a "hard" reliable diagnosis when applied alone.

Additional A-scan criteria, by contrast, lead to such a definite both reliable and accurate differential diagnosis in almost all cases. Among these A-scan criteria, the **A_1-sign** turned out to be by far the best among all A-scan and B-scan criteria used in a prospective study (Ossoinig KC *Detached Retina vs. Dense Fibrovascular Membrane: A-scan and B-scan signs for the differential diagnosis with Standardized Echography* in: Ultrasonography in Ophthalmology 15 (Proceedings of SIDUO XV, Cennamo G and Rosa N, eds) pp.243-262, Kluwer Academic Publishers 1997). In this study, the A_1-sign generated a sensitivity of 98% and a specificity of 100%in correctly diagnosing retinal detachments.

FIGURE 3a:

Clinical Diagnosis: suspected retinal detachment

Day:July/22/2002 **RIGHT EYE**



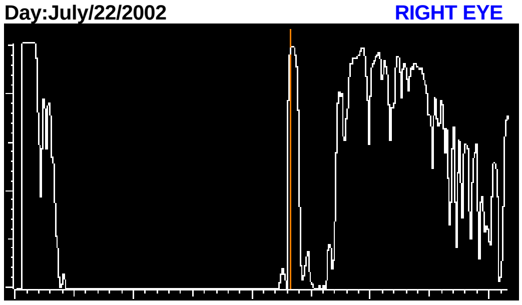
20 MHz B: T 6 PE G=96dB DYN=60dB TGC=0dB

Comments: large folded surface in vitreous cavity OD suggesting retinal detachment

Figure 3b:

Clinical Diagnosis: suspected retinal detachment

Day:July/22/2002 **RIGHT EYE**



Gain: **T= 78.3dB**

A1 Diagnostic Support Information :

Retina + + + (>98% 0)

Comments: definitely retinal detachment

The **A_1-sign** is based on the fact, that retinal surfaces produce clearly stronger signals than most membranes and in contrast to the stronger reflecting very dense membranes have clearly smoother surfaces. Specially designed software in the Cinescan-S recognizes this specificity of signals obtained from retinal surfaces, automatically stores them when received during A-scanning, and classifies them according to reliability into "Retina+", "Retina ++", or "Retina +++" vs. "Membrane +", "Membrane ++"' or "Membrane +++" based on reflectivity and smoothness vs. coarseness.

The **A_1-sign** function of the Cinescan-S usually requires less than 1 minute to produce an unequivocal result and thus represents an invaluable clinical aid in the diagnosis of retinal detachment in eyes with opaque media, especially in eyes with severe proliferative vitreoretinopathies.

6) AUTOMATIC DISPLAY OF TISSUE ABSORPTION (ANGLE KAPPA)

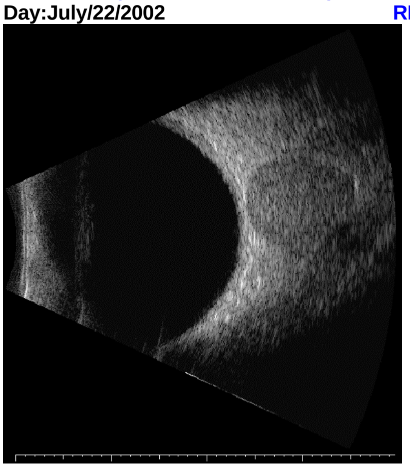
Acoustic absorption is another property of tissues and their differentiation with diagnostic ultrasound is crucial. Differentiation of several orbital tumors, i.e., cavernous hemangiomas, rhabdomyosarcomas, adenoid cystic carcinomas, benign mixed tumors, carcinoids and others show a specific combination of various sound absorption and reflectivity, where diagnosis is greatly helped with Standardized Echography.

Acoustic absorption is indicated by the **angle kappa** (see Figures 4d and 4e). This angle kappa must be evaluated at average medium height of the tissue's echo spikes (excluding its surface signals). In addition, orbital (horizontal) expansion of the display needs to be applied.

FIGURE 4a:

Clinical Diagnosis: unilateral exophthalmus

Day:July/22/2002 **RIGHT EYE**



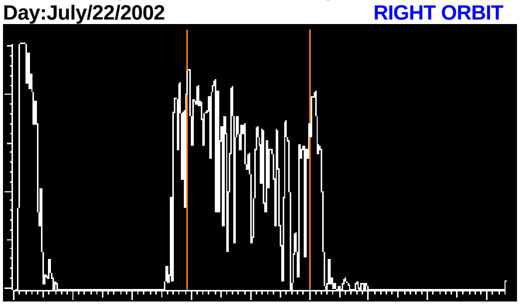
10 MHz B: T6 30PI G=83dB DYN=60dB TGC=0dB

Comments: well-outlined tumor in muscle cone

FIGURE 4b:

Clinical Diagnosis: unilateral exophthalmus OD

Day:July/22/2002 **RIGHT ORBIT**



Gain: T= 78.3Db **7 30 pi**

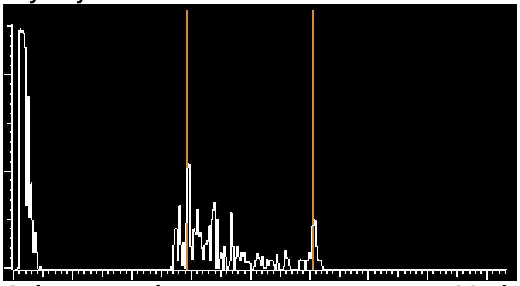
Velocity(m/s):1550 **Distance(mm): 16.12**

AVG Height=56% **Quantitative Echography I=65%**

Comments: orbital cavernous hemangioma

FIGURE 4c:

Clinical Diagnosis: unilateral exophthalmus OD
Day:July/22/2002 **RIGHT ORBIT**

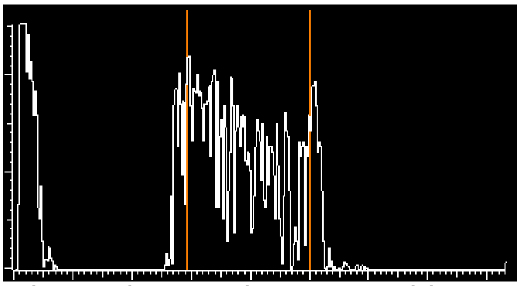


Gain: T-15.7dB **7 30 pi**
Velocity(m/s): 1550 **Distance(mm): 16.35**
AVG Height= 6%

Comments: maximal sagittal diameter16.35 mm

FIGURE 4d:

Clinical Diagnosis: unilateral exophthalmus OD
Day:July/22/2002 **Right ORBIT**



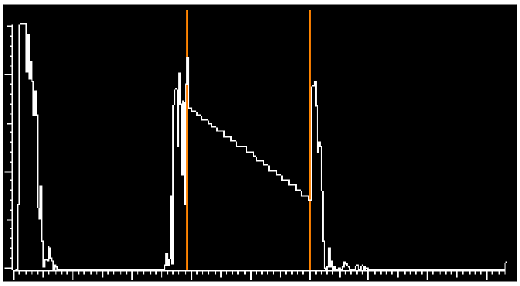
Gain: T -1.5dB 7 30 pi AVG Height=50%
Velocity(m/s) :1550 Distance(mm): 16.12

Angle KAPPA=43.90° ATT=1.17dB/mm

Comments: Angle KAPPA typical for orbital cavernous hemangioma of adults

FIGURE 4e:

Clinical Diagnosis: unilateral exophthalmus OD
Day:July/22/2002 **Right ORBIT**



Gain: T -1.5dB 7 30 pi AVG Height=50%
Velocity(m/s) :1550 Distance (mm): 16.12

Angle KAPPA=43.90° ATT=1.17dB/mm

Comments: Angle KAPPA typical for orbital cavernous hemangioma of adults

The new software in the CINESCAN S instrument allows the echographer to get a graphic illustration of the angle Kappa that can now be displayed on the screen. The corresponding data, i.e., the size of the angle kappa (in **°**) and the corresponding absorption within the examined tissue (in **db/mm**) are displayed in addition to the original echogram as well as its graphical representation.

Note that in the case example illustrated in Figure 4, the gain was automatically reduced by 1.5 decibels to produce medium average spike height of the tumor echogram in order to evaluate and document the sound absorption in this cavernous hemangioma of the orbit (which typically produces an angle kappa of ≈ 45 $^{o)}$. At Tissue Sensitivity this tumor shows a high reflectivity of > 60% (see Figure 4 b). As always, the most accurate measurement is obtained at low Measuring Sensitivity (see Figure 4 c in contrast to Figure 4b).

QUANTEL MEDICAL WOULD LIKE TO THANK PROFESSOR KARL OSSOINIG FOR ALLOWING US TO REPRODUCE THIS DOCUMENT.

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