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# FUNDAMENTALS OF DIAGNOSTIC ULTRASOUND

#### TECHNICAL REQUIREMENTS

In order to integrate scongraphy with extraorpored shock wave therapy, anothern ultrasouth drive suitable for microdiodelial system applications in accordance with the Quality Assurance Agreement pursuant to Section 155, Sub-Section 2, Book V and Camana Cade of Social and V audited to the user, a should adisouted shock wave therapy device. Although the high-end, all-in-one system made by Storz Medical AG. the Dualth 'SD' micro, is an ideal solution both technically and aethicidally, the examples of treatment described below can still be perfectly implemented when separate devices are used.

The examination and treatment room should provide sufficient space for patients and examiners as well as equipment. It should be ensured that the room is well-ventilated and can be darkened or the lighting dimmed in order to eliminate unwarted light sources.

For the ultrasound imaging of the muculookedel system,  $s_2$  5 to 50 MHz inter transforce (mosting pote) and an optional curved-array transforcer for visualiting the lumbar spinal canal should be available. For imaging transformer to be objective z -solve the accomplexity and the children tenden – it may be advisable to use a commercially available tand-off the estimational uttrasend off sets the attractive context and the activation for improved imaging which allows tharmonic wave compensation for improved imaging outputs.

The shock wave therapy system should be uitable for the application of focused block waves and bars an adjusted some [flux dentity (D) of  $a_2$  to  $a_3$  in [judges (m)] per rum.<sup>3</sup> H the system is designed for the use of both found and adjust between, bits fastem will expand the device's field of application, because many of the inductions described bolow are associated with the development of active made target periods. (Tarell [L. 5yag), Dere experiment shows that there can often be addressed more efficitively inducted the data system shows that the the addresses that with facations developed both waves, because many of the inductions developed both and waves the soft has the system of the soft system of the system of the soft system of the

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COMPARISON BETWEEN VELOCITY MODE AND ANGIO MODE (AFTER SCHÄBERLE, 2010) 1 Table 1

When visualizing blood	MODE:	ADVANTAGES:	DISADVANTAGES:
circulation in timure, examiner: can choose between velocity mode (colour-coded Doppire mode); (not angive mode) (power Doppler mode); nor the visualization of influencodory changes in the examined timure, the use of PDI is recommended.	Velocity mode	Visualization of flow velocity and direction with high resolution	Angular dependence of flow visualization with possible aliasing effect
	Power Doppler mode (angio mode)	Visualization of slow blood flows with low susceptibility to arte- facts, irrespective of angle	No information about flow direction and velocity or haemodynamics

Whereas the colour box used in colour-coded Doppler sonography (CF) indicates the flow velocity of the blood cells and their direction (red towards the transducer and blue away from the transducer), in power Doppler imaging (PDI) the direction of flow is not identified and the intensity of the red or vellow colouring indicates the density of reflecting blood cells. The higher the density of the blood cells in the investigated tissue, the brighter the colour visualization appears (Schäberle W. 2010).

To carry out a power Doppler examination, the first step is to create a correct B image of the tissue formation being assessed. The power Doppler is then switched on and the sensitivity of the colour box is adjusted using either bone or a muscle tissue without any abnormalities. It must be ensured that no colour pixels are discernible above these tissues. If this is the case, the gain must be reduced. The size of the colour box is then adjusted to the structure under investigation and the region of interest (ROI) thus defined. This is highly important, as an excessively large colour box can lead to artefacts: this is because vessels passing above the colour box (i.e. superficial vessels) or below it (i.e. deep vessels) can be visualized as colour signals in the area to be examined (Gaulrapp H. 2011).



# OPTIMIZING THE ULTRASOUND IMAGE

The quality of an ultrasound image depends partly on the technical quality of the ultrasound transducers used and the resolution of the image on the monitor, but also - and crucially - on the settings the examiner is able to perform for the ultrasound device.

First of all, the transducer is correctly positioned above the organ/tissue under investigation (i.e. taking into account the alignment of the visualization plane in relation to the right and left edges of the monitor and the desired cross-sectional plane).

#### Upper extremities

### SHOULDER JOINT - STANDARD PLANE I



Indications > Visualization of the subacromial bursa and rotator cuff. Differentiation of degenerative changes and ruptures and calcific tendinitis.

Patient positioning > The patient is seated on the examination table, with the arm in neutral position hanging freely by the side of the body. Technique > The examiner palpates the coracoid process and the anteri-

or margin of the accomion. The ultrasourd transducer is placed above the margin of these bony distance points. The examination starts in metral position and is then complemented by dynamic stars of the shoulder joint in external and internal rotation. During external rotation, the tendon of the subscapularis muscle is disultaged. RIGHT SHOULDER JOINT - STANDARD PLANE I (NEUTRAL POSITION) | Fig. 11



Landmarks in the ventral diagonal scan of the shoulder joint:

- 1. Skin and subcutaneous tissue
- 2. Deltoid muscle
- 3. Deltoid fascia and subacromial bursa
- 4. Tendon of subscapularis muscle
- 5. Coracohumeral ligament
- 6. Tendon of biceps brachii muscle, long head
- 7. Supraspinatus muscle