INTRODUCTION

Ultrasonic imaging is one of the most important, developing diagnostic tools today. State-of-the-art ultrasonic scanners offer real-time grey scale images of anatomical details with millimeter spatial resolution superimposed on which a map of Doppler blood flow information is displayed in full color ***(Cobbold, 2007).***

Clinical applications of these devices are still expanding and the operating frequencies of these devices seem to develop fastly. High frequency (HF) imaging (higher than 30 MHz) yields improved spatial resolution at the expense of a shallower depth of penetration ***(Foster et al., 2000).***

Conventional ultrasonic imaging systems typically use frequencies from 2 to 15 MHz. To improve spatial resolution, one obvious strategy would be to increase the frequency. The axial resolution is determined by the pulse duration or the bandwidth of the pulse. The lateral resolution at the focal point is determined by the product of the f-number, defined as the ratio of the focal distance to the spatial dimension of the transducer, and the wavelength. For a fixed number of cycles per pulse, an increase in frequency would result in a reduction in wavelength and thus pulse duration. As ultrasound frequency is increased to 50 MHz, an axial resolution and lateral resolution of better than 20 and 100 μm for an f-number can be achieved. The price to be paid is an increase in attenuation because ultrasound attenuation in tissues is approximately linearly proportional to frequency ***(Cobbold, 2007).***

The use of ultrasound frequencies in the 40 to 100 MHz range is a relatively new development in ultrasound imaging of the eye ***(Pavlin and Foster, 1998).***

The medical efficacy of ultrasonic imaging has been demonstrated in the anterior segment of the eye at frequencies higher than 50 MHz in diagnosing glaucoma, ocular tumors, and in assisting refractive surgery ***(Foster et al., 2000)***.

High frequency ultrasonic imaging is considered by many to be the next frontier in ultrasound. It has many clinical applications as imaging the eye and skin. Commercial high frequency scanners often termed “ultrasonic bio-microscope”, or UBM, all use mechanically scanned single element transducers at frequencies between 30 to 60 MHz with a frame rate of 30 Frames/Second or lower. To alleviate problems with UBMs which include mechanical motion and fixed focusing, high frequency linear arrays and imaging systems in the 20–50 MHz range have been developed ***(Shung, 2009).***

UBM can create high-resolution images of the chamber angle region, the ciliary body and the anterior chamber, regardless of corneal opacities ***(Azuara et al., 1997).*** Also, after cataract surgery, UBM helps to identify the topographic position of IOL haptics ***(Steiner et al., 1997)***, especially where the anatomy of the chamber angle region is unusual, as in aniridia ***(Schweykart et al., 1999)***. Furthermore, some reports suggested that UBM also may enable ophthalmologists to observe pathologic changes in relation to the normal anatomic structure of the ciliary body with fewer technical difficulties and less deformation of the globe ***(Kunimatsu et al., 1995)***.

UBM is also a helpful diagnostic tool in eyes with primary or secondary dysgenetic glaucoma, in which visualization of the anterior chamber structures is often dramatically hindered by corneal opacities ***(Dietlein et al., 2000).***

UBM has also been used to assess the effectiveness of pressure-reducing mechanisms following filtration surgery since scleral drainage routes and intrascleral reservoirs can be imaged by this form of ultrasound ***(Chiou et al., 1998).***

UBM allows structure details of the angle, iris, ciliary body, zonule and posterior chamber to be visualized and measured , imaging adenxal pathology, assessing corneal and scleral disease, the assessment of anterior segment trauma and for the diagnosis and management of anterior segment tumors ***(Pavlin and Foster, 1998) .***

Clinical detection of ocular foreign bodies after trauma can be hindered by small size, haziness of the optical media, poor patient cooperation, or hidden location. UBM is a valuable adjunct in the evaluation of suspected ocular foreign bodies, especially in cases involving small, nonmetallic objects ***(Deramo et al., 1999).***