USG in Ophthalmology: A Comprehensive Overview Ultrasonography (USG) is a valuable non-invasive tool in ophthalmology, visualizing eye structures, especially when visual clarity is compromised. It uses high-frequency sound waves penetrating opaque tissues, providing detailed anatomical and pathological information. History and Evolution: Mundt and Hughes introduced A-scan USG in 1956 for ocular disease detection. B-scan technology, developed in 1958, enabled two-dimensional eye imaging. Ossoinig standardized instrumentation and techniques in the 1960s, improving accuracy and reliability. The first commercial immersion B-scan instrument appeared in 1972, followed by contact B-scan machines in 1974. Advantages of USG: - Non-invasive and painless. - No ionizing radiation. - Excellent tissue differentiation for clear visualization. - Cost-effective compared to other imaging modalities. Primary Uses in Ophthalmology: - Posterior segment evaluation in hazy media or orbits, assessing structural integrity. - Detection and differentiation of intraocular and orbital lesions. - Localization of intraocular foreign bodies. - Ocular biometry for IOL power calculations. Physics of Ultrasound: USG utilizes longitudinal sound waves consisting of compression and rarefaction of molecules. Sound velocity varies with medium density. Ophthalmic USG uses frequencies between 6 and 20 MHz, with higher frequencies offering better resolution. Reflectivity is determined by density differences between media, with stronger echoes resulting from greater density differences. Ultrasound absorption varies with medium density, denser media absorbing more energy. Instrumentation: Consists of a probe transducer emitting and receiving sound waves, an amplifier boosting the received signals, and a display system for visualizing the data. A-scan probes are small, pencil-sized, emitting a non-focused beam, primarily used for axial length measurements and basic structural evaluation. B-scan probes are thicker, with a focused beam, providing two-dimensional images of the eye. A-Scan Biometry: Provides a one-dimensional representation of the eye's internal structures. Used to measure axial length for IOL power calculations and to detect and differentiate intraocular pathologies. Precise alignment of the probe with the optical axis is crucial for accurate measurements. Immersion A-Scan Biometry: Offers more accurate measurements than contact methods by eliminating corneal compression. Achieved by immersing the probe in saline within a scleral shell placed between the eyelids. Conclusion: Ultrasonography has become an indispensable tool in ophthalmology, providing valuable insights into the eye's anatomy and pathology. Its non-invasive nature, high-resolution imaging capabilities, and cost-effectiveness make it a valuable diagnostic and management tool for a wide range .of ocular conditions