Applications of corrected Scheimpflug crystalline lens/IOL in vivo imaging include customized eye modeling, studies of quantitative changes of crystalline lens morphology with accommodation, aging, or disease, and assessment of new intraocular implants and surgical approaches for the correction of presbyopia.  

The Pentacam’s new densitometry software is not without limitations. A poorly dilated pupil interferes with the device’s sampling technology, and so eyes with pseudoexfoliation, trauma, and intraoperative floppy iris syndrome, for example, are problematic. Also, white cataracts block the system’s ability to sample the central nucleus. Nevertheless, comparison studies with the LOCS III system have shown that the Pentacam better predicts the amount of phaco energy needed to remove various grades of cataract.

(B) Role of Pentacam in Cataract Surgery:–

(1) Pentacam guided phacoemulsification

The ability to preoperatively assess a sampling of the density and volume of the nuclear component of the cataract allows for customization in cataract surgery.

Once the densitometry software determines an individual cataract’s grade, the information may be used in various applications. For example, the surgeon may objectively and reproducibly compare his own phaco settings, technique, energy used, and other parameters involved in removing each grade of cataract.
He may also evaluate how changing his technique or settings affects phaco efficiency on the same cataract grade. Most importantly, the surgeon can share his customized settings and techniques, based on this objective and valid assessment of cataract grades, with colleagues around the world.\textsuperscript{29}

Comparison studies with the LOCS III system have shown that the Pentacam better predicts the amount of phaco energy needed to remove various grades of cataract.\textsuperscript{29}

Even in performing cataract surgery in a patient with coexisting keratoconus and dense nuclear cataracts, we are able to achieve a near emmetropic outcome using information from the Pentacam.\textsuperscript{2}

Also the lens densitometry function of the Pentacam is a useful aid in screening older patients who present for LASIK. For example, individuals in their 50s might note a recent myopic shift that can be documented with the Pentacam to be caused by development of nuclear sclerosis. Based on that assessment, the patient can be counselled to undergo cataract surgery rather than LASIK.\textsuperscript{2}

The device can also assess more subtle phenomena, like posterior capsular opacification and an anterior cortical or anterior subcapsular cataract.\textsuperscript{6}

\textbf{(2)Post Cataract Surgery Evaluation by Pentacam}

The Pentacam is a versatile technology for evaluating the status of pseudophakic eyes (Figure 6-4). It can be used to document the extent of posterior capsule opacification before and after treatment, IOL position relative to the capsular bag, and relationships between piggybacked IOLs.\textsuperscript{61}

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure6-4.png}
\caption{Psudophakic patient evaluation by Pentacam.\textsuperscript{2}}
\end{figure}
The Pentacam also provides a rapid and effective method for documenting IOL subluxation. While that complication can be identified with ultrasound, the ultrasound examination causes much more discomfort for the patient. By providing a clear picture of the IOL, the ophthalmologist might also be able to determine IOL style and based on that information and knowledge of where the surgery was performed, the exact type of IOL present.\(^2\)

![Figure 6-5. The Pentacam calculates best-fit curve and plane.](image)

Software for the Pentacam can easily illustrate the outline of an IOL in most cases. It can then calculate a lens’ best-fit curve and plane in comparison to the optical and geometric axes of the anterior chamber, thus allowing the physician to determine the correct positioning of the IOL (Figure 6-5).\(^6\)

**Accommodative IOL Placement:**

Many refractive lens surgeons will find the Pentacam important for managing the capsule and selecting designs of future accommodative IOLs. They will have to know the thickness of these lenses and the depth of the posterior chamber. The Pentacam can measure true white-to-white diameters. Moreover, researchers are conducting biometric studies in order to produce an “MRI” of the eyeball and ensure the best fit for ICLs.\(^6\)
Another interesting application is in diagnosing Capsular Bag Distension Syndrome (CBDS) (Figure 6-6). 7

(CBDS) is uncommon but well recognized complication after cataract surgery. It is associated with enlargement of the space between intraocular lens (IOL) implant and posterior capsule. It often produces anterior vaulting of IOL optic, anterior bowing of the iris, shallowing of anterior chamber, and a myopic shift. The fluid within the capsular space can turn turbid or cloudy, resulting in decreased vision. 82

Early stages of CBDS are often missed on a slit lamp examination. The Pentacam Scheimpflug imaging is a useful technique to diagnose and document the presence and progress of CBDS (Figure: 6-6). 82

(3)IOL Calculation by Pentacam (Biometry):

It appears to be an excellent tool for demonstrating Elschnig pearls, posterior capsule opacification and late cases of CBDS. 7

Because of advances in surgical technique and IOL design, patients are more and more demanding of excellent uncorrected postoperative vision acuity. Achieving this goal requires a very complete preoperative evaluation, precise measurements, the use of appropriate IOL power calculation formulas, the
selection of the most appropriate IOL for each individual patient, and a flawless surgical technique.  

With the introduction of the IOL Master for the measurement of axial length, many physicians and their staff incorrectly assumed that a near perfect axial length measurement would also produce near prefect postoperative refractive outcomes. Disappointingly, this was not the case. This is due to the fact that IOL power calculations are a multi-part process and perfecting only one part of several parts does not produce perfection.  

Presently, with axial length by the IOL Master being nearly perfect, other issues in the process of IOL power calculations have become unmasked, such as the central corneal power, which has been shown to currently be the single most common measurement error resulting in the need for an IOL exchange. So, with increasing technology, the focus for improving the accuracy of the IOL power calculations has shifted away from the measurement of axial length to the measurement of central corneal power.  

Topography based on direct measurements of corneal elevation points more accurately maps the cornea than Placido-based topography. The Pentacam, an elevation-based diagnostic imaging system, can measure the corneal surface with great accuracy. The Pentacam system uses more measuring points in the central cornea than other systems. The Pentacam's Scheimpflug camera rotates around the center of the cornea, and the reproducibility of the Pentacam's data is ensured by a short measurement time and overlapped images. The precision and reproducibility of this system allow us to appropriately select a K-value (true net corneal power).