العلاج الجراحي لقصو البصر

قصو البصر هو عدم قدرة عدسة العين علي التكيف لرؤية الاجسام القريبة من العين وهو يزداد مع زيادة العمر.ميكانيكية قصو النظر لاتزال غير واضحة ولكن كل الأبحاث تشير بقوة إلى أن ميكانيكية قصو النظر هو نتيجة فقدان مرونة العدسة و فقدان قوة العضلات الهدبية مع العمر.

العلاج الجراحي:

- **جراحات الصلبة.**

1- زيادة حجم صلبة العين وذلك بزرع قطع صغيرة على الصلبة فوق الجسم الهدبي.

2- عمل فتحات صغيرة في صلبة العين باستخدام ليزر الاربيام فوق الجسم الهدبي.

- **جراحات القرنية:**

1- استخدام التردد الاشعاعي لجعل عمل العين الرئيسية للرؤية البعيدة والعين الغير رئيسية للرؤية القريبة.

2- * زراعة عدسة داخل قرنية العين.

* الاكيوفكس وهي عبارة عن قرص يزرع داخل قرنية العين لعلاج قصو النظر وذلك عن طريق زيادة عمق الرؤية .

3-استخدام ليزر الاكسمير:

* وذلك باستخدام الليزك لعمل العين الرئيسية للرؤية البعيدة والعين الغيررئيسية للرؤية القريبة.

* القرنية متعددة البؤر وذلك عن طريق تقسيم القرنية إلي مناطق مختلفة القوة الانكسارية باستخدام ليزر الفيمتوثانية.

*اعادة تشكيل سطح القرنية باستخدام الفيمتوسكندليزرمن خلال الطبقات الوسطى للقرنية والذى يعطى القوة الانكسارية المطلوبة.

- **زراعة العدسات داخل العين:**

1- عدسات متعددة البؤرة : وذلك بزرع العدسة مكان العدسة الطبيعية.

2- عدسات تكيفية : وتزرع بعد إزالة العدسة الطبيعية و تعمل على تحويل قوة انقباض العضلات الهدبية الى حركة أمامية للعدسة المنزرعة.

3- زراعة عدسة متعددة البؤرمع الاحتفاظ بعدسة العين.

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List of contents

Aim of the Work

The aim of this work is to review the recent advances in surgical correction of presbyopia.

Anatomy of the crystalline lens, ciliary muscle and zonule

The crystalline lens, together with ciliary zonule and ciliary muscles, are the important structures of accommodation in humans. The loss of the physiological function of accommodation that leads to presbyopia occurs as the human crystalline lens undergoes profound optical and physical changes with increasing age. These changes occur mostly after the age of 40 years. ***(Vargas,et al. 2001)***

The changes associated with aging of the human crystalline lens.The lens grows in size and weight throughout life. It has been estimated that the thickness of a human lens increases about 0.02 mm per year. As new fiber cells are formed, older cells are displaced towards the center of the lens, or lens nucleus, which becomes denser. The most superficial area of the lens, formed by younger fiber cells, is called the lens cortex. Some of the other changes include loss of the ability to undergo accommodation, changes in spherical aberration, increase in shortest attainable focal length, and decreased ability of the capsule to mold the lens. It is important to

consider these morphophysiological factors associated with the age ***(Vargas,et al. 2001)***

The crystalline lens:

The crystalline lens is a unique transparent, biconvex intraocular structure that lies in the anterior segment of the eye (the ant surface radius 10mm, the post 6mm) suspended radially at its equator by the zonular fibers and Ciliary body between the iris and the vitreous body. Enclosed in an elastic capsule, the lens has no innervations or blood supply after fetal development. Its nourishment must be obtained from the surrounding aqueous and vitreous. Posteriorly, the crystalline lens is supported by the vitreous (hyaloid) face and lies in a small depression called the patellar fossa. In younger eyes, the vitreous comes in contact with the posterior capsule in a circular area of thickened vitreous, the ligamentum hyaloideocapsulare. The potential space between the capsule and the circle of condensed vitreous is called Berger's space. The lateral border of the lens is the equator, formed from the joining of the anterior and posterior capsules, and is the site of insertion of the zonule**.** ***(Vargas,et al. 2001)***

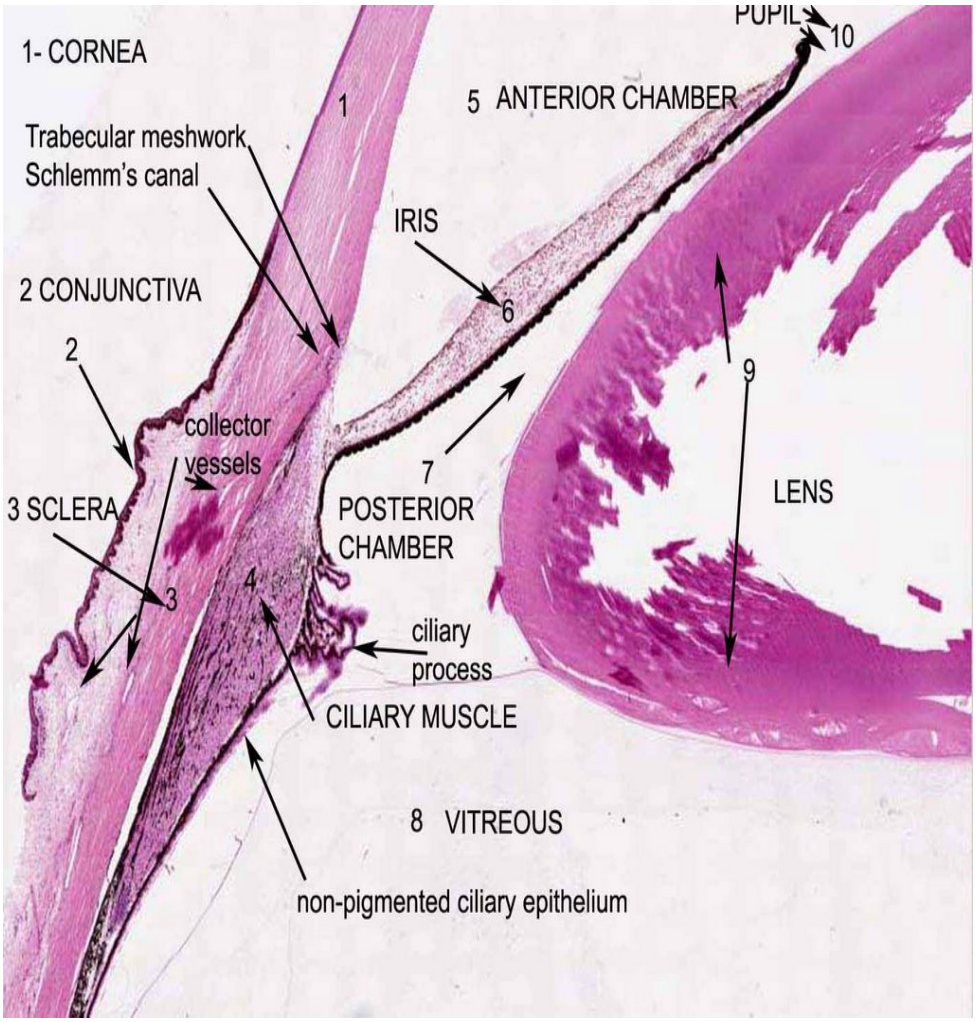

Fig.1: Sagittal section through the front of the eyeball ***(Carmine, 1985)***

The lens consists of three components: capsule, epithelium, and lens substance.

The lens capsule:

It is a transparent homogenous and highly elastic envelope, tending to roll outwards when cut. It is thinnest at posterior pole and thickest close to equator. Synthesis of the anterior lens capsule by the underlying epithelium proceeds throughout life so its thickness increases while the posterior capsule remains constant. The capsule is composed of filaments arranged in lamellae, parallel to surface. It is rich in type IV collagen and other matrix proteins (laminin, heparan sulfate proteoglycan and fibronectin). It is periodic acid Schiff "PAS" positive which stains glycoprotein matrix. Human lenses undergo an age-dependent decrease in capsular elasticity with increasing age. These changes led to the suggestion that presbyopia is entirely attributable to changes in the lens, whereby the decreased molding pressure of the lens capsule fails to mold the increasingly resistant lens substance into an accommodated form. ***(Kortez & Handelman, 1986)***

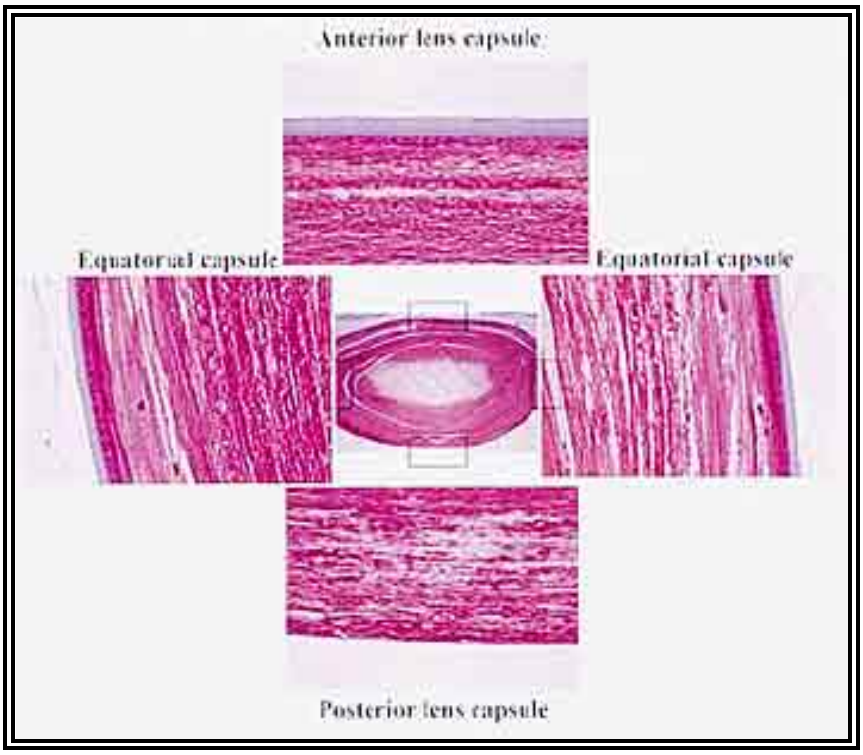

Fig.2: Masson's Trichome stains of the lens capsule ***(Vargas, et al. 2001)***

The aging of the lens substance:

The classical cause of presbyopia is due to sclerosis of the lens substance which may be due to decrease in the water content of the lens substance or formation of various types of chemical or physical bonds between adjacent lens fibers; the hyperpolymerization of proteins. ***(Siebinga, et al; 1991)***

The Ciliary zonule:

It is a series of delicate radially arranged fibers. They arise from the epithelium of the ciliary processes and run toward the equator of the lens. The fibers fuse to form about 140 bundles. The larger bundles are straight and reach the lens capsule in front of lens to form the anterior zonular sheet. The smaller fibers curve backward and are attached to the posterior surface of the lens to form the posterior zonular sheet***. (Snell, 1998)***

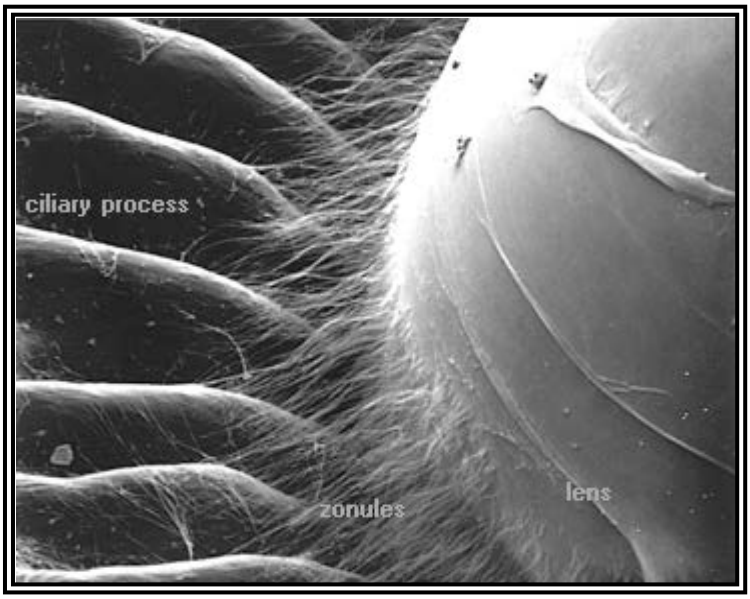

Fig.3: The ultra structure of the lens, Zonule Fibers, Ciliary process.
(Roger, Fred, 2006)

The Ciliary body:

It appears as a right triangle with one side forming the lateral boundary of the posterior chamber. The two principal parts of the ciliary body include the pars plicata (corona ciliaris) and the pars plana (orbicularis ciliaris). The pars plicata forms the anterior 2 mm of the ciliary body and contains the ciliary processes. The orbicularis ciliaris (pars plana) is the posterior, flat part of the ciliary body measuring 4 to 4.5 mm in length. Histologically, the human ciliary body consists of seven layers **(Figure.4):**

1. The outermost lamina fusca or suprachoroidal tissue plane
2. The ciliary muscles
3. The layer of vessels
4. The basement membrane of the pigmented ciliary epithelium or external basement membrane, also known as the lamina vitrea
5. The pigmented ciliary epithelium
6. The non pigmented ciliary epithelium
7. The basement membrane of the non pigmented ciliary epithelium, or internal basement membrane***.(Strenk, et al; 1999)***

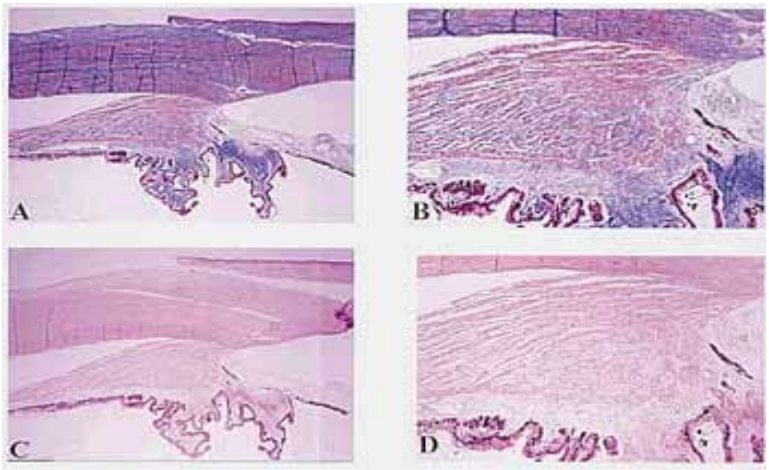

Figure 4. Histology of a normal ciliary body of the human eye showing corona ciliaris (pars plicata) and orbicularis ciliaris (pars plana). Pars plicata shows ciliary processes lined internally by the non pigmented and pigmented ciliary epithelia, the vascular layer, and muscular layer composed of the circular, radial, and the longitudinal muscles. The longitudinal muscle inserts into the scleral spur. A,B: Masson's Trichome stains. C, D: PAS stain

(Schachar. 1996)

Aging of the ciliary muscle and zonule:

Main age-related changes in the ciliary body include the hyalinization of the ciliary processes and ciliary portions of the ciliary muscle, a nodular hyperplasia of the pigmented ciliary epithelium of the pars plana and of the pars plicata non pigmented epithelium. Concerning age-related changes in the zonule, the fetal and infantile zonular fibers are finer and less aggregated than in the adult. On the other hand, in the elderly,

the zonular fibers are finer and sparser, and they rupture more readily. The zonular attachments are narrow, especially in the first two decades of life. With aging, they broaden and move more centrally, both anteriorly and posteriorly. The zonule-free zone of the anterior capsule reduces from 8 mm at age 20 years to 6.5 mm (or even as low as 5.5 mm) at about 80 years of age. ***(Strenk, et al. 1999)***

Optical principle of presbyopia

Presbyopia is defined as a progressive age related loss of accommodative amplitude **(Figure 5).** The progression of presbyopia begins early in life and culminates in a complete loss of accommodation by about 50 years of age. Presbyopia is the most prevalent of all ocular afflictions since it eventually affects 100% of the population. Presbyopia generally results in a need for a near spectacle correction or near addition lenses such as bifocal reading glasses in order to see clearly at a comfortable reading distance. (**Robert, 2004)**

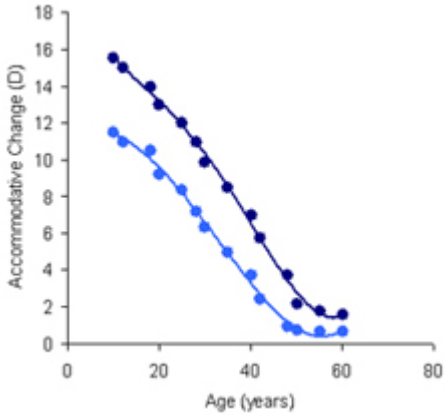

Figure 5: Maximal and minimal accommodative amplitudes as a function of age measured in 1500 subjects using a "push up" technique(**Daune,1912)**