The role of femtosecond laser in refractive surgery

Ismail Mohammad Mousa

Summary and ConclusionsFemtosecond laser application allowing deep corneal application of laser pulses As a Corneal and Refractive Surgeon. this new tool will change the way we approach corneal surgery.The femtosecond laser technology introduces high precision cut; it creates a flap under very low vacuum, delivering the laser energy directly to the corneal stroma through a disposable glass lens. The outer surface of the cornea suffers no trauma, and the procedure is painless. The intralase FS laser is a solid – state laser that does not rely upon a mixture of gases to generate a beam, as does the excimer laser. It uses a very short pulse with a spot size of 3 microns. This enables the laser to apply less energy to the corneal tissue with micron range accuracy. It use a wavelength of 1053 nm that is not absorbed but instead can pass through the cornea with no effect on the tissue until it reaches the pre – programmed target. The beam is optically sharpened into a 3 – micron spot size and delivered to the predetermined intracorneal location. The laser pulses are places close together to define precise subsurface areas of photodisruption.)13)The IntraLase FS laser uses infrared light to precisely cut tissue by a process known as photodisruption. The specialized software that supports the IntraLase laser directs the process of focusing the laser beam into a tiny, 2-3 micron spot of energy. The beam passes harmlessly through the outer layers of the cornea until it reaches its exact focal point within the stroma. Upon reaching this focal point, the beam forms microscopic bubbles of carbon dioxide and water vapor. Thousands of these bubbles are placed at a precisely controlled depth to define a dissection plane. Using the rapidly fired IntraLase laser and interconnecting the bubbles very tightly creates a corneal flap with remarkable precision and accuracy. The shot of femtosecond later produces laminar smallest air vesicles in the accurately determined cornea depth .The femtosecond laser femtec is an infrared laser, which works with a wavelength of 1052 nm. It sends ultrashort laser pulses with a diameter of 0.001 mm. A femtosecond is equivalent to a trillion seconds (1015 sec). These are the new generation lasers called femtosecond titanium sapphire lasers. The duration of their pulses is only 25 quadrillionth of a second.With the femtosecond laser, tissue can be cut very precisely and nearly without any development of heat. In eye surgery, the laser is used primary for cuts in the inner part of the cornea, e.g. for preparation of tunnels for ICRS.Contrary to the excimer laser, the laser pulses do not develop theirenergy on the surface of the cornea, but at an exactly-defined depth in the inner part of the cornea. Each laser

pulse produces a micro gas bubble that separates the tissue (photodisruption). With the help of thousands of computer-positioned laser pulses, three-dimensional, highly-precise laser cuts in the inner part of the cornea have become a reality.During surgery, the laser energy is focused precisely at a defined depth of corneal tissue. Thus, micro plasma is created, which evaporates corneal tissue of about 1 micrometer in diameter. A microbubble consisting of carbon dihydrate and water (diameter 5-12 micrometers) is created. It expands and separates the surrounding corneal tissue. This mixture is sucked off by the endothelial pump function. Thousands of these laser pulses separate the intrastromal corneal tissue and produce very precise stromal cuts with sharp edges.used a different femtosecond laser technology for a different indication (flap preparation during LASIK surgery), but they confirmed better post-op values of astigmatism when femtosecond lasertechnology was used.There are no earlier reports about the treatment of keratoconus patients with ICRS using femtec?s femtosecond laser technology for tunnel.Femto – Lasik :The PulsionTM IntraLaser is a computer precise intrastomal approach for creation of flap. The laser offers safe and predictable alternative to the mechanical microkeratome and metal razor blade. The Pulsion FS intralase laser utilizes an ultra-fast femtosecond pulse and a long wavelength to create photodisruption at a very precise point within the cornea without altering any surrounding tissue. The tiny 2 to 3 micron pulses are optically delivered through a disposable applanation lens while fixating the eye under very low vacuum. A resection plane is created by placing the pulses very closely together in a spiral patern, and then stacking the spots along the periphery until the surface is perforated. The hinge may be preprogrammed by the surgeon at any location on the corneal surface.CONCLUSION:Femtosecond lasers represent an exciting new technology for the performance of the important first step of LASIK surgery. Clear advantages and disadvantages have emerged after several years of widespread usage, and it is likely that further experience and refinement will make femotsecond lasers the predominant method of LASIK flap creation.Finally surgeons may put down the blade for femtosecond laser.