A Study on femtosecond laser interaction with natural dyes

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Abstract

A femtosecond is the SI unit of time equal to 10-15 or 1⁄1 000 000 000 000 000 of a second; that is, one quadrillionth, or one millionth of one billionth, of a second. A femtosecond is equal to 1000 attoseconds, or 1/1000 picosecond.The femtosecond laser is a high-energy optics technology used for eye surgeries and other medical procedures, including all-laser LASIK. During this bladeless procedure, your surgeon uses the femtosecond laser to create a flap in your cornea before altering the shape of the underlying tissue to correct your vision. An attosecond is equal to 1000 zeptoseconds, or 1⁄1000 of a femtosecond. Because the next higher SI unit for time is the femtosecond (10−15 seconds), durations of 10−17 s and 10−16 s will typically be expressed as tens or hundreds of attoseconds: 100 attoseconds: fastest-ever view of molecular motion.

Keywords: Femtosecond, laser,zeptoseconds, attoseconds, 300 nanometers,optical pulse, attosecond

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I. Introduction

A femtosecond laser is a laser which emits optical pulses with a duration well below 1 ps (→ ultrashort pulses), i.e., in the domain of femtoseconds (1 fs = 10−15 s).The generation of such short (sub-picoseconThat means it goes about 30 centimeters - about one foot - in one nanosecond. In one femtosecond, light travels just 300 nanometers - about the size of the biggest particle that can pass through a HEPA filter, and just slightly larger than the smallest bacteria.A femtosecond laser is a laser which emits d) light pulses is nearly always achieved with the technique of passive mode locking. An attosecond is equal to 1000 zeptoseconds, or 1⁄1000 of a femtosecond. Because the next higher SI unit for time is the femtosecond (10−15 seconds), durations of 10−17 s and 10−16 s will typically be expressed as tens or hundreds of attoseconds: 100 attoseconds: fastest-ever view of molecular motion.A zeptosecond is a trillionth of a billionth of a second. That's a decimal point followed by 20 zeroes and a 1, and it looks like this: 0.000 000 000 000 000 000 001. The only unit of time shorter than a zeptosecond is a yoctosecond, and Planck time. A yoctosecond (ys) is a septillionth of a second.While one attosecond is 10-18 seconds, one zeptosencond is 10-21 seconds. That is 3.33e+12 times faster than light. So this would need to be the Flash speed when racing fast enough to perceive events happening in less than an attosecond

II. Methodology:

II A Measurement of femtosecond pulses

Nanosecond pulses can be easily measured using a fast photodiode and an oscilloscope. The fast photodetector produces a pulse of current that mimics the optical pulse, and an oscilloscope capable of reproducing the pulse traces it on a screen.

II B Use of LASIK for femtosecond Laser

During the All-Laser LASIK procedure, our experienced surgeons rely on femtosecond lasers to create a corneal flap. With this particular surgery, the laser is used in the place of thin-flap microkeratome.

II C Function of the Autocorrelator

The basic principle of an optical autocorrelator is to split an incoming pulse into two copies and to superimpose those with a variable temporal delay. A nonlinear interaction is used for obtaining a signal that depends on the pulse overlap, and the pulse duration can be retrieved from that signal.

II D Determination of Pulse shape

Your lasers pulse shape as a function of time. Even for a very short pulse width down to nanoseconds.The FPS one can be powered from its internal battery or from the wall plug power supply.

II E Why do PRK instead of LASIK?

Most commonly though, patients have PRK instead of LASIK because the PRK procedure requires less corneal tissue thickness compared to LASIK, which is of significant consideration for patients with naturally thinner corneas, higher amounts of nearsightedness, or both.

II F Is femto laser covered by insurance?

I take this opportunity to explain that although the femtosecond laser provides additional safety and produces better outcomes, the Centers for Medicare & Medicaid Services (CMS) categorize the femtosecond laser as a non-covered service because it corrects and manages astigmatism.

II G Which is cheaper PRK or LASIK?

The difference in price between LASIK and PRK can be as much as $1200. LASIK surgery ranges in price between $1000 to $2600 per eye to perform. PRK laser eye surgery's average cost is $2000 to $4000 for both eyes. Both procedures are considered an elective procedure and therefore are typically paid out of pocket.

II H Is PRK worse than LASIK?

Ultimately, neither LASIK nor PRK is better or worse than the other. Both are relatively low-risk procedures when performed on suitable candidates, and both are capable of producing exceptional results. Modern technology has made both procedures safer and more dependable than ever before.

II.J Does Medicare pay for cataract surgery using laser?

But does Medicare cover laser cataract surgery? Luckily, the answer is **yes**. Medicare coverage includes surgery done using lasers. Medicare Part B benefits only cover the Medicare-approved amount for cataract surgery.

III. K Disadvantages of Laser cataract surgery

The major disadvantages of femtosecond laser-assisted cataract surgery are high cost of the laser and the disposables for surgery, femtosecond laser-assisted cataract surgery-specific intraoperative capsular complications, as well as the risk of intraoperative miosis and the learning curve.

IV. Results and discussion:

The global surgery concept for a surgical procedure includes the incision, the procedure itself and the closure, no matter how those steps are accomplished. So, whether you use a femtosecond laser or a diamond knife, Medicare pays you the same fee.

Medicare pays the same amount toward cataract surgery whether a surgeon conducts it with or without a laser. However, laser surgery has a higher cost and is used for those who have astigmatism and need a premium lens implant. ... It does pay for monofocal lenses, however, which surgeons typically use.

Astigmatism can affect your near and distance vision, often causing mild blurring or double vision. We are able to determine the amount of astigmatism affecting your vision during your cataract evaluation. The good news is, if you have astigmatism, it can now be corrected during your advanced laser cataract procedure.

Recent research has shown that an astigmatism left untreated at the time of cataract surgery tends to worsen after cataract surgery. So, while the removal of the cloudy lens by the cataract will improve your vision, you may notice blurred vision caused by the worsening of your astigmatism.

If you're 65-or older and your doctor has determined surgery for your cataracts to be medically necessary, Medicare will typically cover 80% of your expenses including post-surgery eyeglasses or contacts.

The Toric IOL is Medicare approved. Medicare and most insurance companies will cover a portion of the cost of this procedure. The fees associated with the lens upgrade may be compared to the cost of glasses to correct astigmatism after surgery.

These astigmatism-correcting IOLs enable a person who had astigmatism prior to cataract surgery to see clearly for driving, computer use, reading and other tasks without eyeglasses after cataract surgery. In 2019, the average premium for a toric IOL was $1,521 per eye.

Toric IOLs are best for treating moderate to severe astigmatism. A recent advancement in Toric IOLs is the new Multifocal Toric IOL.

The lens that the surgeon implants during cataract surgery is durable and will last a lifetime, according to Mayo Clinic.

V. **Conclusions**

The main advantages of femtosecond laser-assisted cataract surgery are standardized corneal incisions, perfectly centered and round capsulorhexis, lens nucleus fragmentation even in eyes with hard cataracts.The major disadvantages of femtosecond laser-assisted cataract surgery are high cost of the laser and the disposables for surgery, femtosecond laser-assisted cataract surgery-specific intraoperative capsular complications, as well as the risk of intraoperative miosis and the learning curve.

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