



ADULT STRABISMUS SURGERY

What is Strabismus?

Strabismus is a condition when the eyes do not line up with each other. The eyes may be crossed inward, outward, or one eye may be higher than the other. Normally, the muscles surrounding each eye work together to move both eyes in the same direction at the same time. Strabismus occurs when the eye muscles are either too tight or too weak. Strabismus also occurs when the brain has lost or never developed the ability to move the eyes together in a normal way.

An adult patient might have had strabismus since childhood that recurred over time as an adult, or he or she might have had an illness or injury later in life.

What causes Strabismus?

Strabismus that occurs in childhood, often has no known cause, although it tends to run in families.

Sometimes strabismus develops when the eyes compensate for other vision problems, such as farsightedness. This is a common condition in childhood when eyes are small. When this occurs, the lens of the eye must dial up a very high power (auto-focus), which causes the eyes to automatically cross. This can be corrected by relaxing the need to auto-focus with a pair of farsighted glasses.

Adults may develop strabismus if they have had a history of strabismus in childhood. Strabismus can recur any time after correction from surgery, glasses or patching as a child.

Adults who have never had strabismus as a child, may develop it as a result of multiple conditions; aging of the muscles of the eye, damage to the eye itself, stroke, Grave's disease, and various other muscle and nerve disorders.

What is binocular vision?

Each eye sees a slightly different picture and angle of the world. Binocular vision is the ability of the brain to take these slightly different images and merge them into one image that gives information about depth (stereo vision). This is a complex skill that is developed as a child. If the strabismus developed at an early age, it is possible that this skill was lost or never present. Without binocular vision, your depth perception may be limited. Sometimes glasses and/or patching will help, but other times surgery is required.

Will strabismus cause double vision?

If strabismus begins in childhood, the answer is no. The child learns to ignore the image from one eye to avoid the double vision. Or if the alignment is small, the brain rewires the misaligned eye to perceive a new "center of vision" when both eyes are open.

On the other hand, if strabismus occurs as a young adult or an older child, the brain may not ignore the second image resulting in double vision that can become quite unbearable. These patients might try closing one eye, tilting their head, using prisms, or

blocking the vision in one eye using occluders (examples include bangerter foils, tape on glasses or a black "pirate" patch) to alleviate the symptoms.

What is a "Lazy Eye" and how is it related to Strabismus?

Sometimes strabismus is called a "lazy eye" or a "wandering eye". The terminology is confusing.

- A "wandering" eye is an eye that is misaligned or has strabismus.
- A "lazy" eye is when the vision is poorer in one eye relative to the other. This can occur sometimes but not all the time in patients who have strabismus. The technical term for lazy eye is amblyopia.

Strabismus (misalignment) does not necessarily lead to a "lazy" eye with decreased vision. It depends upon several factors such as the age of the patient, whether the eyes alternate deviation (e.g. one eye wanders sometimes and then alternates to the other eye), how long the deviation has been there for, whether it is intermittent or constant, or if there is a different prescription in each eye etc. Each situation is unique to the patient.

On the other hand, an amblyopic eye or an eye that sees poorly for any reason may develop strabismus shortly after vision is lost. This is because an eye that does not see well cannot communicate to the brain where to direct that eye.

Can amblyopia be treated?

Amblyopia (or "lazy eye") is a problem with vision that develops in childhood where the brain does not learn to see clearly out of the eye. When it occurs with strabismus, it occurs because one eye is favored over the other eye. Once amblyopia develops in childhood, it should be treated when the child is still young, so the vision can become closer to equal in both eyes. Amblyopia is treated with patching the good eye in children. The outcomes of strabismus surgery are generally better when the vision in both eyes is equal or nearly equal.

Amblyopia can't be treated in adults, but if the eyes are misaligned they can still be straightened even if amblyopia is present.

Am I too old to have my strabismus treated?

No. You can have eye muscle surgery at any age, as long as you are healthy and fit enough for surgery. Many adults have been told that there is nothing they can do, but this is not true. In most cases, eye muscle surgery is a successful, safe, and effective treatment for strabismus in adults.

In addition to improving the alignment of eyes, treatment can also improve binocular vision and even expand the field of vision in some cases. Other benefits include the improved appearance of eyes. Some of you may have heavy prism glasses, or bothersome occluders/patches, which you may rid, after surgery.



Are certain individuals not a candidate for eye muscle surgery?

There is a very small group of individuals who have had double vision and brain injury who unfortunately, despite having their eyes realigned will continue to have double vision. These individuals may still benefit from surgery from a cosmetic point of view but may need a cosmetically accepted frosted lens in their glasses or a black contact lens to alleviate the double vision.

Patients who have a specialized group of muscle or nerve disorders such as muscular dystrophy, CPEO, myasthenia gravis, spastic cerebral palsy, may have worse outcomes to surgery or not be good surgical candidates. These individuals should discuss their case with Dr. Iizuka.

Other candidates not suitable for strabismus surgery are people who feel strongly that they do not want to wear glasses after surgery. Before surgery you may not have double vision because the images of each eye are so far apart. After surgery, the images are brought much closer together. The brain then must work to refine and place the images on top of each other in a process called fusion. If your brain is unable "fuse" the images, you may see double. In this situation, glasses with prism become a necessary and regular part of the treatment. Therefore, individuals who normally do not wear glasses have to accept the chance that they may need glasses for the rest of his/her life after surgery.

Therefore, individuals who normally do not wear glasses have to accept the chance that they may need glasses for the rest of his/her life after surgery. People who have had LASIK surgery or wear contact lenses and cannot accept this possibility are definitely not good candidates for strabismus surgery. Other possible treatments will therefore need to be discussed.

I already had an operation, when I was a child, and was told that the muscles cannot be operated on anymore. Is this true?

This is not necessarily true. Treating complex eye muscle problems is a highly sub-specialized area of ophthalmology that requires added education and experience. There are newer techniques and surgical approaches that can benefit patients who might not have had these options when they were young. Of course there are some cases that really can't be fixed, but the only way to know about your case is to discuss it with Dr. Iizuka personally. Sometimes, if your case is particularly unusual, we may take photographs or ask other experts in the field for their opinions.

Is eye muscle surgery to correct strabismus considered cosmetic surgery?

Many people feel embarrassed or shy about treating their eye misalignment for fear of appearing vain or superficial. Eye muscle surgery is not considered a cosmetic surgery. Strabismus surgery attempts to take an abnormal condition and make it more "normal", unlike cosmetic surgery, which treats a normal condition in order to enhance it.

Many people who have strabismus feel self-conscious of their appearance. This affects their communication skills, self-confidence and in many cases, their job performance. It is not uncommon to feel less inclined to introduce yourself to strangers to avoid having to worry about their reaction to your eye condition.

In addition to hindering eye-to-eye contact, strabismus causes problems with visual function. As we said earlier, some adults develop terrible double vision. Others may have trouble driving. There is no doubt that the treatment of strabismus is considered a reconstructive, not cosmetic, medical intervention.

What are the goals of Strabismus surgery?

This is a **very important** question. When the eyes are too far apart, the brain has no way to bring the eyes together. The purpose of the surgery is to bring the eyes to a straighter position such that the brain has a better chance of adapting and moving the eyes closer to center on its own. The surgery can significantly improve your existing eye crossing but rarely, is it completely gone or "cured". The surgery tends to have temporary results in some patients, but still can have lasting results in others. We cannot often predict who will have lasting results.

Surgery can reduce the amount of crossing and/or the frequency of crossing. The crossing, however, may still appear when your child is tired or ill but less often and less severely. This residual small amount of crossing (inward or outward) is expected and is sometimes technically referred to as a "monofixation" state. Studies have shown that a monofixation state leads to a lasting alignment over time. You will likely not even notice this small amount of crossing after surgery.

Therefore, the aim of surgery is to improve the existing condition enough so that their eyes seem essentially straight (or with a very small but acceptable deviation) most of the day, with the added benefits of improved appearance and functionality. Repeat surgery, however, is very common over one's lifetime to get back to a more acceptable state of alignment again.

For individuals who have double vision, the goal of surgery here, is to alleviate the double vision in the straight ahead position and reading position (down gaze) or to expand the field of single vision. Some double vision in far side gaze or up-gaze may have to be tolerated after surgery, but these fields of gaze are generally less functionally important than straight ahead. Usually, most patients are not bothered by this, or compensate automatically with head movements.

How is eye muscle surgery performed?

In both children and adults, the surgery is usually performed under general anesthesia, although some adults can be done awake. Once asleep, an incision is made over the white part of the eye called the conjunctiva, which covers the muscle. The muscle of interest is separated from the eye and reattached with tiny sutures back to the eye but in a different position. One of more eye muscles may be operated on. Changing the position of the muscle mechanically changes its ability to pull by either strengthening or relaxing/weakening it. This new position of the eye muscle changes the angle of the eye but still allows the eye to move in all directions.



Note that the eyeball is not removed and there are no lasers used. The sutures dissolve on their own in about 6 weeks. You may have a patch after surgery, which must be kept in place until I remove it on the day of or the next day after surgery.

We may recommend for some individuals, either on the same day, or the next day after surgery, that the position of the eye muscle be further adjusted while the patient is awake. This is performed with topical anesthetic in a procedure room or in the clinic. This takes about 10-30 minutes. Understandably the patient may be anxious during the adjustment, but this is not a painful experience in general and most people discover it's not as bad as they imagined.

I've heard of using Botox instead of eye muscle surgery. Am I candidate for that?

In rarer cases, Botox (botulinum toxin) is injected into the muscle for patients in whom recovery of a muscle is expected. In general, Botox is not a permanent solution, requiring repeat injections; as such, it is used only in very special circumstances.

What are the costs associated with Strabismus Surgery?

The strabismus surgery and the follow-ups are covered by OHIP. The eye drops are not covered by OHIP unless you are over age 65. Also, in order to achieve the optimal results, be prepared for the following costs after surgery:

1) **GLASSES:** Before surgery, a new pair of glasses without prism may be prescribed if your old pair has prisms in them (or you can use an old pair that does not have prism). After surgery you may need to wear glasses even if you don't currently wear them. Or you may be prescribed new glasses that have prism in them if you develop double vision. As your eye heals, you may even go through several pairs of new prescriptions up to one year after surgery. We recognize that this is costly and sometimes we will avoid changing the prescription but instead prescribe Fresnel prisms, a cheaper temporary option. Please be prepared for the potential of these high costs.

2) **FRESNEL prisms:** these are temporary stick on prisms that are fitted by the optician onto a pair of glasses. This can cost anywhere between \$50 and \$100 per prism plus the cost of the glasses if you do not currently own a pair. You may require multiple changes up to a year after your surgery or none at all.

How successful is eye muscle surgery?

The success rate is 80 to 90%. About 10-20 percent of patients will need more than one surgery within 3-6 months of the first procedure. This tends to occur in patients with more complicated surgery (e.g. a patient who has both a vertical and horizontal problem or who has had strabismus operations in the past). In general, when the surgery doesn't work the first time, we wait a few months to reassess and let the eyes heal to a stable alignment. It is uncommon that we can't correct the alignment in a subsequent operation. About 1 in 25 patients will need 3 or more

surgeries in the first year after surgery. You may have double vision while waiting for surgery, which we can alleviate with Fresnel prisms or temporary occlusion with a semi opaque tape placed on the glasses.

So, it is still possible that you may have to come back a couple of months after surgery needing another operation. Over your lifetime, your eye muscles continue to grow and age. Hence, there is a chance that you may need surgery at any time later in your life. Several patients only need one surgery for life. Often times, this is patient specific depending upon your type of strabismus.

What are the most serious risks of surgery?

1. **Risk of anesthesia:** For a healthy individual, anesthetic risks are very small and are comparable or less than the risk of serious injury from a car accident.
2. **Vision loss:** Irreversible vision loss is very rare but may occur. In terms of vision loss, this surgery is safer than LASIK or cataract surgery.

What are some other complications or limitations of surgery?

The main limitation is that surgery might not correct the problem. Despite our best efforts and careful measurements and adjustable sutures, some patients end up needing more surgery. This is because our muscles act like rubber bands that react to surgery in a bell-curve-like distribution. This means that although most people have average eyes and fit within the normal distribution, others may be over or under corrected after surgery. We cannot predict who these individuals are. Therefore, in some cases, this may mean you develop double vision that you didn't have before, or the double vision that you did have doesn't go away until subsequent surgery.

Other complications that can occur but are highly unlikely include:

- Infection deep in the eye leading to permanent loss of vision requiring hospitalization, treatment with antibiotics and removal of infection with surgery.
- Loss of the muscle (slips or does not stick down to the eye ball) during or immediately after surgery with permanent damage to the control of the movement of the eye
- Perforation of the eyeball requiring additional laser or cryotherapy or retinal surgery
- Uncontrolled bleeding and vision loss
- Persistent scarring of the white part of the eye that doesn't go away
- A change in eyelid position that requires surgery to correct.
- Reaction to the suture material requiring it to be removed.

If any of these complications, you will require more follow up appointments. However, many of them can be managed successfully to a certain degree.

What do I expect to see and feel after surgery?



The eye(s) will be red and weepy after surgery. The eyes will feel scratchy, sore or feel like something is in your eye for the first few days after surgery. This is due to sutures that will gradually soften over time until they are completely absorbed at approximately 6 weeks. You will also notice slight swelling of your lids, light sensitivity, and mild blurry vision. These symptoms are not so bad that you can't function around the home. Usually the symptoms in the eye that had the adjustable suture are a little worse and lasts a little longer. All these symptoms should get better in the first few days and not worse.

Do not be alarmed when you experience some double vision immediately after surgery. The double vision may be present all the time, only once in a while or only when looking in certain directions. This is a result of your brain getting use to the new position of your eyes. The double vision gradually improves over several weeks. Eye exercises may be prescribed 1 week after surgery to improve the alignment.

In the mean time, if you have double vision that is interfering with your job or driving, you can put piece of semi clear cellophane tape to the backside of the lens, alternating between the left and right eye every other day. Try to spend a few hours at the end of each day with the tape removed to train the brain to get use to the new position of the eyes.

Most of the time, any persistent double can be successfully treated with a new pair of glasses with prisms approximately 2 months after surgery. Unfortunately, there are no such things as CONTACT LENSES with prisms in them. These glasses will feel like an ordinary pair of glasses. I may use Fresnel prisms first to test this first. If these prisms are inadequate, you may need a second operation. This will not be decided for several weeks/months after you heal. Note that some double vision may have to be tolerated in far side, up or down gazes (see goals of strabismus surgery above).

What activities can I do after surgery?

Most adults only need to be off of work for about a week or less. Some patients are back to work in a few days, others may take more than a week if there is double vision or unusual discomfort. The redness can take months to completely resolve, but each day is a little better than the day before.

Avoid swimming/saunas or hot tubs for 3 weeks after surgery. If you have double vision, cover one eye when you are driving until this resolves. Otherwise, there are no limitations. You can read, watch TV and use the eyes as much as you want. Note, you will need to put eye drops in the operated eye(s) 4 times a day for 10 days after surgery.

Are there any worrisome signs after surgery?

Watch for any warning signs problems that could indicate infection or slipped muscle in the first week to 10 days after surgery such as

- Worsening vision
- Increasing redness, or greenish discharge
- Increasing pain, especially on movement

- Inability to move the eye, making the eye appear frozen or stuck (slipped or lost muscle)
- One eye not healing as well as the other eye in bilateral surgery

Any of these symptoms are a medical emergency. If they develop call my office immediately to be seen that day. If it is after hours or on a weekend, call locating at St. Michael's hospital at 416 864 5431 and ask to speak to the resident on call. Or go to your nearest emergency department immediately.

What follow up appointments are necessary? Will I still need glasses?

You are usually seen on the same day or one day after surgery, one week after surgery and one month after surgery. Thereafter, you will be seen 3-6 months after surgery for a year, then annually either by the referring physician or an ophthalmologist.

Yes, you will still need your glasses after surgery. You may be prescribed glasses after surgery, even if you didn't wear them before surgery (see Costs question).

One final comment:

There are many websites in the US that advocate vision therapy or orthoptic exercises over surgery. The World Wide Web is open to all who have an opinion. Most of these therapists have good intentions but their methods are often based on anecdotal evidence. In fact, some exercises may worsen your condition and cause double vision. When we think exercises can help, we will offer that, or in some cases prisms, patching, glasses or Botox as we have mentioned earlier.