Refractive Surgery in Children: Indications and Contraindications

A letter circulated within the ophthalmic community has spurred many surgeons to comment with their opinions.

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* Editor’s Note: The following article is a compilation of responses to a letter (see below) from a fellow member of the ophthalmic community. Although this surgeon has asked that his name be removed from the letter, he invited CRST Europe to publish the responses in the hopes of spreading awareness of this sensitive topic. The editors have obtained permission to reprint the responses from all of the surgeons included in this article. The opinions expressed herein are those of the respondents and not necessarily of CRST Europe.

Dear Colleagues,

I am writing to you as a distinguished expert in the field of refractive surgery because I need your professional opinion regarding the matter of refractive surgery in children. There has been a strong campaign by one of the local clinics in my community about the feasibility of such surgeries in underage children. The propaganda was presented as video commercials with strong emotional content, stating that there was finally a solution for small children to get rid of their spectacles, calling for “humanitarian” actions by their parents to resolve the refractive problems of their children. Many patients have already been treated using LASIK.

I would kindly ask you to present your professional point of view regarding this delicate subject. I would encourage you to clearly address all the aspects of such surgeries in underage children, including the indications and contraindications and the appropriate means that this information should be transmitted to the general public.
17-year-old female patient for whom you have records for dating back 3 years and who has more than 2 years of stable refraction and proper stable tomographic and biomechanical parameters is a candidate for laser vision correction. I would like to refer to Dr. Daoud’s recent review on this topic. This may be helpful as a reference. There is a need for improving ectasia screening, preferably through large, prospective, multi-center, randomized, controlled, clinical trials.

We still do not have proper eye-tracking devices for procedures typically performed under general anesthesia, when the patient is unable to collaborate with fixation. However, topographic decentration in these cases is not as bad as one might anticipate.

Unfortunately, many colleagues do not respect refractive surgery, using elective procedures such as LASIK and PRK for pediatric patients. I agree that dealing with such colleagues is a challenge. There is another distinct situation that may be more common: keratoconus in teenagers and the indication for corneal collagen crosslinking (CXL) with or without surface custom ablations. When and how to do it are important points that, currently, also lack guidelines.

Unfortunately, many colleagues do not respect refractive surgery, using elective procedures such as LASIK and PRK for pediatric patients. I agree that dealing with such colleagues is a challenge. There is another distinct situation that may be more common: keratoconus in teenagers and the indication for corneal collagen crosslinking (CXL) with or without surface custom ablations. When and how to do it are important points that, currently, also lack guidelines.

**WALLACE CHAMON, MD**

Aside from the concerns of long-term follow-up and procedure alignment, in my opinion, as a cornea surgeon, the most relevant issue is corneal elasticity in infants. Unfortunately, we cannot measure corneal elasticity accurately, but anyone who has done pediatric corneal grafts knows how fragile a child’s cornea is.

Nowadays, most of us would not consider performing LASIK in an 18-year-old patient with the same clinical picture as a 45-year-old because we consider young age a risk factor for corneal ectasia. Additionally, there is a growing incidence of PRK-related ectasia.

Treating amblyopia is always a strong argument for the use of LASIK in pediatric patients, but myopic amblyopia is not that important, and we are not good at treating high hyperopia.

Hypothetically speaking, let us consider surgery in a 2-year-old with a plano refraction in his right eye and -5.00 D in his left. Treating -5.00 D at this age should not improve his long-term prognosis. I would rather deal with the amblyopia now (the worst-case scenario is that the patient will not tolerate the contact lenses) and deal with the high myopia (that shall limit potential visual acuity anyway) later.

You are doing a great thing trying to expose your population and authorities to some serious provisions in health policies.

**ARTHUR CHENG, MBBS, MRCS, FCOPTH, FRCOPHTH**

LASIK has no place in the pediatric population. Unpredictability, biochemical response, and susceptibility to trauma are all reasons against operation in these young kids. Alternatives, something as simple as contact lenses, are perfectly fine. Are you able to run a counter-campaign to highlight the issues that these kids may suffer undergoing surgery at this age?

**ARTHUR CUMMINGS, MB ChB, MMED(OPHT), FCS(SA), FRC(S)ED**

Interesting situation. Here are my thoughts: LASIK, or any other refractive surgery, is: (1) elective, (2) meant for patients 18 years or older, (3) contingent upon a stable refraction, and (4) intended for use in patients who understand the risk-benefit ratios and are able make a decision at their leisure with no pressure put on them.

LASIK is indicated for children only if the following conditions are all met: (1) the child has anisometropic amblyopia, (2) cannot be corrected satisfactorily with contact lenses or glasses, and (3) if LASIK was not performed, the eye would be lost for further use due to the anisometropic amblyopia.

There is no place for LASIK in children who simply want to get rid of their glasses. A child’s refraction is by no means stable; he is still growing. Children are not mature enough to make a decision like this, and they are not mature enough to undergo a procedure like this under topical anaesthesia.

Any advertising for surgery, whether directed at adults or children, should never put pressure on anyone to have the surgery. There should be no emotional pressure put on parents. It is unprofessional and downright unethical.

The use of LASIK in children should not be advertised anywhere. It should be a professional referral from someone (ie, general practitioner, optometrist, or ophthalmologist) who understands the anisometropic amblyopia and wants your professional opinion as to what the best treatment options are for the child. It is a medical referral, not an elective procedure referral.

**PAULO ELIAS C. DANTAS, MD**

When information is derived from propaganda, it lacks consistency. Taking into consideration that corneal biomechanics in children is not well documented, predictability of refractive procedures in this population is a shot in the dark.

Once again, some so-called refractive experts are prematurely performing experimental (and even unapproved) surgical procedures on their patients without knowledge of the clinical basics and with improvised instruments and tools.
The situation you described sounds like a déjà-vu for many procedures done in the recent past without any guilt and/or regret for doing it—sometimes on behalf of humanitarian or pseudoscientific purposes (ie, financial interest).

MOHAMED ALAA EL-DANASOURY, MD, FRCS
Refractive surgery in pediatrics is indicated only in anisometropia; to prevent or treat amblyopia; and only after other measures fail, such as contact lenses and glasses. Even in such cases, corneal surgery is not the best solution. Phakic IOLs are preferable because they do not change corneal biomechanics like keratorefractive surgery does. Moreover, many of these children will develop later in life some form of forme fruste keratoconus that cannot be diagnosed at such an early age. These patients, if subjected to corneal refractive surgery, will progress to corneal ectasia and eventually need a corneal transplant. I understand the psychological aspect of this matter but cannot justify subjecting these children to such an unnecessary risk.

PAUL HUGHES, MD, FRANZCO
I concur with my colleagues in renouncing LASIK in young children as a means to get rid of their glasses. The biomechanics of the young cornea, not to mention refractive stability, make this a no-go zone. In Australia, the minimum age for LASIK is 18 years old.

One of my colleagues here in Sydney performed LASIK on a young patient with Down syndrome in an effort to prevent amblyopia some years ago. The procedure was done under general anesthesia; I do not know the outcome.

I hope that all the responses you receive, placed in the correct hands, will shut this LASIK center down.

OSAMA IBRAHIM, MD
I believe refractive surgery, not necessarily LASIK, in patients younger than 18 years of age should be confined only to anisometropic cases (mostly myopic but also hyperopic and astigmatic). In these cases, the primary aim is not to get rid of glasses but to help the child wear proper glasses and perform efficient occlusion and other amblyopic therapy. It should never be done bilaterally.

I performed radial keratotomy, automated lamellar keratoplasty, and myopic keratomileusis for anisometropic children from 1987 to 1994. I may claim that we have the largest series of LASIK in anisometropic children with more than 860 eyes and more than 10 years of follow-up. Keeping in mind that emmetropia is not always our goal, safety, predictability, and efficacy in children is similar to that in adults. Regarding stability, patients who became emmetropic had a tendency to maintain it, even if the other eye progressed. However, patients with an undercorrection continued to lose the effects of surgery, and the condition progressed similarly to other eye. Cases with overcorrection also lost effect, but not as much as the other eye.

MIRKO R. JANKOV II, MD, PhD
There are several aspects of the problem, specifically medical, legal, and ethical issues.

From the medical point of view, refractive surgery is the last resort, when all other solutions, such as spectacles and contact lenses, are of no use. I emphasize the need for persistence, good training, and motivation so that patients and children do not give up prematurely. Only when all such efforts are in vain can we dare to think about refractive surgery.

Then comes the element of indications. It would make sense to perform refractive surgery in highly anisometropic children who cannot use contact lenses and who are young enough for the surgery to make a difference in visual development, of course conjugated with occlusion of the opposite eye. That would restrict the indication to children up to 6 or 7 years old, as beyond that age amblyopia is already established and is resistant to conventional treatment. However, typical patients are older than that, when surgery would have no impact on the already developed amblyopia. Patients in general, especially parents in this case, confound the high refraction with amblyopia, expecting the surgery to miraculously cure amblyopia by removing the refractive error altogether.

Regarding predictability in this population, it is known that growth and development of the eye usually occurs during an individual’s late teens or early 20s. There are, of course, patients who mature earlier or later than average, and there is no way we can tell at that early age when this will happen. It is, at best, a guessing game what the refraction will be when it stabilizes, resulting in poor predictability. Moreover, the biomechanical response of young corneas has not been well studied, casting an even darker shadow on the refractive outcomes in these patients.

Safety is, from my perspective, the sorest point of refractive surgery in underage children. Knowing that keratoconus, the main absolute contraindication for refractive surgery in adults, has its onset in puberty, it seems to me irresponsible to ignore that fact and count on luck regarding the patient’s future. Although CXL has indeed changed the course of treatments for keratoconus (especially if detected early), by no means should we irresponsibly produce grounds for keratectasia.

Legal and ethical grounds are extremely sensitive: (1) refractive surgery is elective; (2) the child is unable to understand or consent to surgery, and therefore a third party (parents) must be involved; and (3) there is an emo-
tional dimension to this whole problem. Most parents would do almost anything to help their children, and that is when they turn vulnerable and susceptible ideas into miraculous solutions and magic formulas.

Commercializing and advertising refractive surgery in children should be considered highly unethical because it feeds on emotional rather than rational grounds. This kind of surgery, if indicated at all, should be referred by a doctor rather than through commercial campaigns of any kind.

To conclude, refractive surgery should not be performed in under age children because it is not shown to be safe. There are excellent alternative treatments with significantly lower risks. In extremely rare occasions, refractive surgery could be a solution in children up to 6 or 7 years old; however, the way it is presented to the parents is of highly sensitive nature.

DAVID T.C. LIN, MD, FRCSC

I am even less inclined than some of my colleagues to do LASIK in children due to the biomechanics of the younger corneas being less rigid than older corneas. We do not know the ectasia risks of LASIK in children, even those children with normal corneal thicknesses. Dealing with colleagues with different standards is always difficult.

KRISTINA MIKEK, MD, MSc

I completely agree with a lot of the answers sent to you from colleagues around the world. Refractive surgery in pediatrics is controversial and only potentially indicated in anisometropia cases to prevent or treat amblyopia. Until now, we have not done any pediatric case at our center.

What I can add to this topic is that, in our center, the minimum age for laser refractive surgery is 21 years old. In our protocol for preoperative examination of young patients, we always double-check the measurements at least 6 months apart. In this way, we can assure that the refraction and topographic changes are not progressive.

DAN Z. REINSTEIN, MD, MA(CANTAB), FRCSC, DABO, FRCOPHTH

I have no experience with pediatric LASIK or PRK; however, I cannot see how this can currently be performed simply for the elective correction of refractive error in children. Here are the reasons why: (1) currently, there is an inability to diagnose keratoconus, (2) it is an elective procedure, (3) there are potential visual complications, (4) informed consent must come from a third party (ie, parents), (5) there is no long-term data on safety in children (yet), and (6) under general anesthetic, no subjective fixa-
tion is possible. However, it may be an acceptable procedure if the surgeon was saving vision in a patient with anisometropia and/or amblyopia ex anopsia. In these cases, it should be a monocular treatment to balance the patient’s prescription.

LUIS F. RESTREPO, MD

LASIK in children and teens is a controversial subject. To be brief, most qualified refractive surgeons are against doing it. The first reason is so simple that it admits no discussion: LASIK modifies the shape of the cornea, and long-term results and stability are based on the capacity of the cornea to keep that change in shape, or better, in its inability of smoothing the changes. In any case in which that premise cannot be fulfilled, that patient is not a good candidate for LASIK.

The human eye reaches its adult size at approximately 14 years of age; however, as with any statistic, there are deviations. In some cases, the human eye does not reach its adult size until 17 years of age.

A growing organ changes its shape. So how could any surgeon give a prognosis of stability if he is changing the shape of an organ that is also changing shape by itself? In the best case, it will be only a guessing game. Refractive errors usually change during childhood and adolescence, with most remaining unstable into the person’s early 20s: How can you perform surgery for an error whose final value you cannot even guess?

I would say that aside from some controlled clinical studies and specific cases, the refractive surgery community rejects the practice of LASIK in children and teens.

JOSÉ SALGADO-BORGES, MD, PhD

I have been performing LASIK since 2000. The minimum age I have treated with this modality is 19 years. In my opinion, it is dangerous to do refractive surgery before the complete maturation of the patient’s refractive status. There may be, however, a few exceptions to this rule, such as patients with amblyopia who did not benefit from other refractive corrections, such as glasses or contact lenses.

PAULO SCHOR, MD

For you to make public use of these expert answers, it may be better to normalize them in terms of safety, stability, and predictability. Generally speaking, refractive surgery in children in comparison to adults is less safe because children may lose their best vision; less stable because the result may not last; and less predictable because perfect vision may not
be achieved. This may be enough for the public to understand how dangerous refractive surgery in children is.

THEO SEILER, MD, PhD

Regarding PRK and LASIK in children, there is only one indication: anisometropia and the danger of amblyopia. This restricts the age of the candidates to 6 years and under; for teens, I have never seen any indication.

The most problematic danger of pediatric LASIK and PRK is the unknown biomechanics in children. Not only is the child’s cornea much softer—corneal surgeons know this from daily experience—but even more difficult is the predisposition to keratoconus, which cannot be determined at that age. Therefore, I would expect a storm of iatrogenic keratoctasia once we open the market for pediatric LASIK.

ALEKSANDAR STOJANOVIC, MD

We have been highly restrictive on this matter in Norway; only a few such surgeries have been performed. The indication has always been amblyopia with anisometropia. Even in these cases, refractive surgery is only warranted if all other conservative alternatives have been exhausted.

I would be especially skeptical to do LASIK in children knowing that the corneal biomechanical stability is lower in young eyes. Even with the most amiable surface ablation, refractive surgery in children should be performed as the last resort. Commercializing and advertising refractive surgery in children would be considered highly unethical in Norway.

JERRY TAN, MD

I am shocked and appalled that your colleagues are performing LASIK in children. It is tantamount to malpractice that doctors perform LASIK on children to correct their refractive error. I think you should report these doctors to your country’s medical council for disciplinary action. I hope you will be able to stop these doctors from performing LASIK surgery on these children. I have attached a copy of the Singapore government’s Ministry of Health Guideline on LASIK surgery for you to submit to your country’s Health Ministry and Medical Council for their review. (Editor’s Note: The guideline is not reproduced here.)

I think the need for LASIK in children is unnecessary. In children, their refractive error is not stable and will most likely increase as they age. I have been fitting contact lenses on babies and young children successfully for many years. I think failure to wear contact lenses successfully depends on how good the ophthalmologist is at fitting the contact lens as well as whether the patients are motivated or not to wear them.

In all patients seeking refractive surgery, whether as a young adult or an older person, the most important factor is that the refractive error must be stable. Studies show that children have increasing myopia between the ages of 8 and 18 years. Afterward, their myopia tends to stabilize. I always tell parents that nothing is easy, and performing LASIK does not make it easier for them. They will still have to be careful because of the possibility of shifting the flap due to trauma—and we all know children are active and can get injured in the eye easily.

Also, there is now NeuroVision (NeuroVision, Inc., Singapore), a noninvasive vision correction method that can help most amblyopic cases, even in adults. Because of the drawbacks of early LASIK, I would be much happier to perform no surgery on a child’s eye because it is still growing.

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