

Manual small incision cataract surgery as an alternative treatment in Argentina

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Abstract

The prevalence of blindness (visual acuity $\leq 20/200$) due to bilateral cataract in Argentina is 0.8% in the population aged 50 years or more, but the current cataract surgery rate (CSR) is insufficient to meet this situation. Although phacoemulsification dominates in the private sector, and has the advantage of using foldable intraocular lenses (IOLs), to increase the CSR it can be argued that manual small incision surgery (MSICS) is the preferred alternative because it can utilize cheaper rigid IOLs. Furthermore, in developing countries, hypermature cataracts are more common and easier to extract using MSICS. Moreover, phacoemulsification requires expensive, high-maintenance equipment and disposable MSICS does not, and the operation can be completed in 6 minutes by a trained surgeon permitting a faster patient turnaround for high-volume operations. While phacoemulsification provides better uncorrected visual acuity (VA), VA with best possible correction is similar in both groups. Because 30% of non-operated individuals cannot meet the costs of cataract surgery, it is suggested that MSICS be adopted as the technique of choice in Argentina as it is less expensive, provides comparable outcomes to phacoemulsification, and can be readily incorporated at dedicated cataract surgery centers

Key words: cataract, MSICS, phacoemulsification, Argentina.

Cirugía manual de catarata con incisión pequeña como tratamiento alternativo en Argentina

Resumen

La prevalencia de la ceguera (agudeza visual $\leq 20/200$) causada por catarata bilateral en la Argentina es 0,8% en la población de 50 años de edad o más. Sin embargo, la tasa de cirugía de catarata (TCC) actual es insuficiente para enfrentar esta circunstancia. Aunque la técnica de facoemulsificación domina en el sector privado y tiene la ventaja de utilizar lentes intraoculares (LIO) plegables para aumentar la TCC, se puede argumentar que la cirugía manual de catarata con incisión pequeña (MSICS, por sus siglas en inglés) es preferible porque posibilita el uso de LIO rígidas, que son menos costosas. Además, en los países en desarrollo, las cataratas hiper maduras son más frecuentes y más fácilmente extraíbles usando la MSICS. La facoemulsificación requiere también de equipos costosos y difíciles de mantener, además de insumos que la cirugía de incisión pequeña no necesita. Además, la intervención puede ser completada en 6 minutos por un cirujano capacitado, permitiendo un flujo mayor de pacientes en las instalaciones de alto volumen quirúrgico. La facoemulsificación sí ofrece mejor agudeza visual (AV) sin corrección, aunque la AV con la mejor corrección es similar en ambos grupos. Dado que 30% de las personas no operadas no pueden enfrentar el costo de la cirugía de catarata, se sugiere la adopción de la MSICS como la técnica preferida en la Argentina por ser menos costosa, ofrecer resultados comparables con la facoemulsificación y por ser de fácil incorporación en los centros dedicados a la cirugía de catarata.

Palabras clave: catarata, cirugía manual, incisión pequeña, facoemulsificación, Argentina

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Introduction

In spite of technical advances directed at improving cataract surgery results, the trend toward ever-smaller incisions, insertion of foldable IOLs, and the demand for refractive results as precise as the insertion of multifocal IOLs requires, the ophthalmological situation from the point of view of community eye health must also be considered. From an ophthalmological perspective, Argentina is a developing country in which the figures for blindness due to cataract are increasing, with all the socio-economic costs that implies, in spite of the cause being easily reversible.

In order to improve upon this situation it will be necessary to incorporate into ophthalmological practice a simple technique, such as manual small-incision cataract extraction, which will permit high-volume surgery with results similar to those of phacoemulsification. This technique will need also to be more cost-effective compared to phacoemulsification.

Blindness due to cataract in Argentina

According to published studies^{1,2}, the prevalence of blindness (visual acuity of $\leq 20/200$) due to bilateral cataract in Argentina is 0.8%

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in the population aged 50 years or more. In addition, 56% of blind persons have lost their sight due to cataract. The cataract surgery rate (CSR) was 1744 surgeries per million inhabitants in 2001², but has only risen to 2089 in 2007 (Lansingh, personal communication). While the CSR needed to eliminate cataract in Argentina was originally suggested to be 3000 for the year 2010, based upon older general World Health Organization (WHO) data³, because of the lack of accurate data in the entire country and the rapidly ageing population, it needs to be a lot higher. Thus, it can be easily deduced that unless the number of surgeries currently performed increases, the prevalence of blindness due to cataract will also increase.

According to Nano et al, the primary reasons why individuals do not have access to surgery are: cannot pay for the surgery (32%); unaware of presence of cataract (21%); and contraindications for cataract surgery (18%)¹. Another factor to be considered is the sector in which the operation is performed. A study conducted in 2001 showed that 91% of cataract surgeries were performed in the private sector, with only 9% in the public sector². In the year 2001, there were approximately 95 ophthalmologists per million population, giving an average of 18 operations per ophthalmologist per year².

Socio-economic costs of blindness

The idea of increasing the volume of cataract surgeries to reduce blindness in Argentina has a considerable economic motive, although the financial and social costs of disabilities are difficult to calculate. However, an Australian study estimated the socio-economic impact and costs entailed by low vision, and found that disability due to blindness entails two types of costs: direct and indirect⁴. Direct costs of visual disabilities are costs to the health-care system, including medical visits, hospitalizations, medications, laboratory studies, and other expenses. Their estimated annual cost in Australia is AU\$1.8 billion dollars. However, the indirect costs are even higher, and include reductions in productivity of persons unable to continue working in their usual occupations, pensions received due to disabilities, and the cost of nursing care or the lowered productivity of affected families due to the need to spend time helping disabled persons. The estimated annual indirect cost in Australia is AU\$3.2 billion, which is nearly twice the direct cost. Visual disability was found to prevent healthy and independent old age because it is associated with: (a) doubling of the risk of injury due to a fall; (b) tripled risk of depression; (c) risk of incurring a hip fracture, which that is 4 to 8 times greater compared to individuals with normal visual acuity; and (d) a doubling of social dependence and reduction of independence.

Surgical technique alternatives and management suggestions: a manual for small-incision cataract extraction surgery

There are several alternative surgical techniques and management possibilities that can reduce costs and operation time at a cataract surgical center. First, anesthesia can be topical or subtenon; it can be performed by auxiliary personal so that it is complete when the surgeon is ready to operate. Second, to form an anterior chamber, a viscoelastic substance can be replaced by an anterior chamber maintainer (ACM). Third, to perform the circular continuous capsulorhexis (CCC), a cystotome fabricated from a 27G needle can be employed instead of using rhexis forceps. Fourth, if an ACM is used, it should be noted that although the generated hydraulic pressure will often force out the nucleus, aspiration of the cortex will need to be accomplished manually, and can be achieved using straight or curved two-way cannulas, connecting the aspiration needle to a 2.5 mL disposable syringe. If one is available, an infusion/aspiration pump can also be used.

As can be seen in the photographs (Figures 1-3), the surgeon works with one microscope and two operating tables so that there is never an interruption; one changes gloves and begins working on the following patient, who is already sterilized with a blepharostat in place. The surgeon can also work with the same instrument assistant, forming a team that with practice optimizes both the results and the time used in surgery. Standardizing the process permits cataract surgery at high volume without inducing more fatigue for the surgeon. Furthermore, using inexpensive instruments with high surgical volume sharply decreases fixed costs. Finally, it must be said that the training for phacoemulsification surgery has a steeper learning curve compared to small incision cataract surgery.



Figure 1. The surgeon starts the first surgery while the ophthalmic assistant starts to prepare the next patient on the operating table below.



Figure 2. While the first surgery was underway an ophthalmic assistant has the next patient ready for the surgery.



Figure 3. Without a break the surgeon is ready to start the second surgery, switching the microscope to the other operating table.

MSICS versus phacoemulsification: advantages and disadvantages

Current objectives in cataract surgery

The key objectives in cataract surgery are: (a) rapid mobilization of the patient, (b) a minimum of induced astigmatism, and (c) rapid vision rehabilitation. The major differences between MSICS (manual small incision cataract surgery) and phacoemulsification are shown in Table 1. One advantage of phacoemulsification technique is that it employs a 2.8-3.5 mm sutureless incision allowing implantation of foldable lenses, but many countries

do not use foldable lenses even with phacoemulsification and thus it would seem a waste to perform surgery using a 3 mm incision that has to be subsequently enlarged to 6 mm. Rigid lenses are cheaper and can still be implanted via a small sutureless incision (5.5 mm) per the MSICS technique.

In developing countries, hard nuclei or hypermature cataracts are more often encountered and these are easier to extract using MSICS compared to phacoemulsification. In addition, expensive, high-maintenance equipment and disposables are required for phacoemulsification, which

Table 1. Advantages and disadvantages of MSICS and phacoemulsification.

Phacoemulsification	MSICS
Advantages	
Sutureless 2.8-3.5 mm incision	Small 5.5 mm self-sealing incisions
Possibility of placing foldable lenses	Rigid lenses are implanted (low cost)
Length of the surgery > 15 minutes	Length of the surgery < 10 minutes
	Rapid patient turnaround permits high-volume work
	Low-cost equipment
	99% success rate
Disadvantages	
Presents difficulties with hard nuclear cataract or hypermature cataracts	Larger incision compared to phacoemulsification
High cost of obtaining and maintaining equipment	Rigid lenses should be used
High cost of foldable lenses	Microincision techniques exist that allow cataract removal through a 3.5 mm incision
Institutions without access to foldable lenses increase incision to 6 mm	

adds to the cost. MSICS offers a lower cost alternative to solve blindness due to cataract: a rigid lens can be implanted and the operation can be completed in 6 minutes by a trained surgeon permitting a faster patient "turnaround" for "high volume" operations with low cost equipment.

MSICS versus phacoemulsification: safety and efficacy

MSICS has spread to many parts of the world, but its origins lie in India where a study with a 6-week follow up was performed comparing it to phacoemulsification⁵.

The study was carried out with 400 patients (400 eyes) in which the method of surgery was randomly assigned. The patients were operated on by 4 surgeons trained in both surgical techniques; each surgeon operated on 100 eyes, using each surgical technique on 50 eyes.

Success in both techniques was surgeon dependent. At 6 weeks both groups achieved equally good postoperative visual outcomes with 98.4% realizing a visual acuity (VA) of > 6/18 (best possible correction). The difference in astigmatism between the 2 techniques was also not statistically significant, although there was intra-surgeon variation. While it was found that reducing the size of the incision did not result in lower astigmatism, several studies have demonstrated that postoperative VA depends on the incision size^{6,9}. The average change in astigmatism found was 0.10 to 0.20 D for 3.2 mm incisions and 0.20 to 1.00 D for 5.5 mm incisions. This difference can be analyzed from several points of view. If the objective of cataract surgery is to implant multifocal lenses so that near vision spectacles do not have to be used and there is goal to improve visual acuity from 6/9 to 6/6, then a 3.2 mm incision is the correct choice. However, if the aim of the intervention is to reduce blindness due to cataract and individuals have a VA of > 6/24 in the best eye with the best possible correction, then a 1.0 D change in astigmatism is an acceptable overcome. In summary, although phacoemulsification provides better uncorrected visual acuity, VA with best possible correction is similar in both groups.

The phacoemulsification group had a greater incidence of postoperative edema on the first postoperative day, although this difference disappeared by 6 weeks. Shallow anterior chambers on the first post-operative day, retained cortex fragments, and iritis were similar in both groups. A single case of cystoid macular edema was observed in the phacoemulsification group.

Currently there are no data comparing both techniques in Argentina, perhaps because most surgeons use phacoemulsification. However, based on worldwide data, we feel that manual small incision technique is as safe as phacoemulsification and nearly as effective, and is thus a viable alternative whenever capital investment for a phacoemul-

sification machine and its associated operating expenditures are not available. Importantly, the manual small incision technique allows work in high volume.

Discussion

Manual small incision cataract surgery is not merely a surgical technique; it is the consequence of a worldwide need¹⁰, especially to increase the volume of low-cost cataract surgery in developing countries. Clearly in Argentina it is necessary to take steps in this regard. While we do not know the cost of blindness in Argentina, there is data concerning the high socio-economic costs that visual disabilities imply, as shown in the Australian study. Using data from that study to calculate the costs of blindness, we must convince the authorities, and ourselves as ophthalmologists, that investment in campaigns for the prevention of blindness is important, and that it is more costly to have a blind person than to carry out surgery. This proposal is one that must be discussed at institutional and national levels. In Argentina we have a blindness prevention committee, and a national blindness prevention program¹¹ that had a goal of 20,000 cataract surgeries for the target population in the year 2007. Although it is known that the CSR was 2089 per million population in 2007, there are as yet no statistics available on how many cataracts have been operated on under this plan and if the rate has risen because of the plan implementation or because of the growing of the private sector. But it seems important to emphasize that at the national level there is an understanding of the need to stimulate the performance of cataract surgery.

But what each of us does as an individual, and the responsibility we have as ophthalmologists in regard to blindness in our country is also important. As was stated in the Introduction, cataract is responsible for half of all blindness in Argentina, and 30% of non-operated individuals are excluded because they cannot meet the costs involved. Here we have an inexpensive technique that does not require the investment in equipment or maintenance that phacoemulsification does, but which permits us to carry out high-volume surgery with comparable results. Manual small incision surgery has the advantage of low costs and of the advantage of using of high quality but very inexpensive intraocular lenses.

Fixed costs include opening of the operating theater, training, and the cost of personnel, but if with the MSICS technique we can operate on 20 patients instead of 10, we can cut fixed costs per patient in half, allowing us to offer them more accessible services. As our performance improves, the operation becomes ever more profitable. For example, one surgeon in India takes only about 5 minutes per surgery. Naturally that surgeon uses personnel

specialized in the procedure and who have been assisting for years.

Currently there are approximately 116 ophthalmologists per million population in Argentina providing an average of 18 operations per ophthalmologist per year. However, that does not tell us how many cataract surgeries each is performing. By knowing the countrywide prevalence of blindness due to cataract as well as its incidence, we can calculate the needed CSR to eliminate cataract as cause of blindness over the coming years to meet the VISION 2020 goal. Furthermore, the combination of data will determine how many surgical ophthalmologists will need to be recruited and trained in regard to cataract in addition to the ophthalmologists already performing surgery. In the interim, we can also encourage the community of ophthalmologists to perform more surgeries. For example, there may be insufficient awareness that there are people who need our services, and that there are enough cataract surgeons to meet the demand. In addition, the offer of high-quality service at low cost will not be in competition with the demand for phacoemulsification that the private sector will continue to meet. Working to promote community eye health and prevent blindness does not mean working for free. Patients who are blind due to cataract are still the ones who must take responsibility for their situation, but we must offer them a service that they can afford with the resources they possess.

Manual small incision cataract surgery, also called the Blumenthal technique, is not just a different surgical technique but the expression of a different ideology. It is an effective and profitable means of reducing blindness due to cataract. The proposal is to bring differentiated services and surgery and a scale of fees adapted to the income level of the patient into the private sector, while achieving the same medical results, and also bringing the concept of high-volume surgery into public hospitals, since it is those hospitals that treat the lowest-income patients.

A high percentage of the population has access to the National Institute of Social Services for Retired and Pensioned people (PAMI) system of medical assistance, and the proposed technique could be encouraged as a way for it to meet the surgical demand. It would also be possible to promote achievement of our national prevention of blindness plan, which is committed to providing IOLs and supplies for performing cataract surgeries, perhaps while offering incentives to the members of the community of ophthalmologists not currently performing surgery to begin doing so, and asking them to take charge of the geographical area in which they work. Another important point is that about 20% of those blind with cataract do not know they have that disease, which means that it is necessary to perform outreach services to determine the

affected population outside the reach of normal health-care services and carry out campaigns to bring that population into health-care facilities for diagnosis. But we cannot carry out screening campaigns if we are not prepared to cover the surgical demand it causes, and so we must possess the tools and a health-care system that can remove the cataracts that are found.

In Argentina there are 116 ophthalmologists per million inhabitants, and this means we have the human resources to increase our cataract surgery rate. As ophthalmologists we are responsible for the prevention of blindness in our country, and training in community eye health is an important part of that concept. If indeed phacoemulsification continues to be the preferred technique, we can also see what other countries with socioeconomic levels similar to ours are doing, and make use of the tools they have shown that are useful in the prevention of blindness. There is of course nothing wrong with improving our surgical repertoire and adopting the latest technical advances, but we must also adjust to the realities of our community and provide solutions for the needs that are found there.

References

1. Nano ME, Nano HD, Mugica JM, Silva JC, Montaña G, Limburg H. Rapid assessment of visual impairment due to cataract in cataract surgical services in Argentina. *Ophthalmic Epidemiol* 2006; 13: 191-7.
2. Nano ME. Audit of cataract surgery rate in Argentine Republic for 2001. Ministerio Salud. Secretaría de Programas Sanitarios. Servicio Nacional de Rehabilitación y Promoción de la Persona con Discapacidad. 2004. Available at: [http://boletinocular.bvsalud.org/files/3/5/081517402004/Audit%20of%20cataract%20Surgery%20Rate%20%20in%20the%20Argentine%20Republic%20\(3\).doc](http://boletinocular.bvsalud.org/files/3/5/081517402004/Audit%20of%20cataract%20Surgery%20Rate%20%20in%20the%20Argentine%20Republic%20(3).doc). [cited 2008, September 12].
3. World Health Organization. *Global initiative for the elimination of avoidable blindness*. Geneva: WHO, 1997 (WHO/PBL/97.61 rev 1).
4. Clear insight: the economic impact and cost of vision loss in Australia. The Center for Eye Research Australia, August 2004. Available at: <http://www.cera.org.au>. [Cited 2008, September 19].
5. Gogate PM, Kulkarni SR, Krishnaiah S, et al. Safety and efficacy of phacoemulsification compared with manual small-incision cataract surgery by a randomized controlled clinical trial. *Ophthalmology* 2005; 112: 869-74.
6. Olson RJ, Crandall AS. Postoperative randomized comparison of phacoemulsification cataract surgery with a 3.2 mm vs 5.5 mm sutureless incision. *Am J Ophthalmol* 1998; 125: 612-20.
7. Oshika T, Nagahara K, Yaguchi S, et al. Three year prospective, randomized evaluation of intraocular lens

implantation through 3.2 and 5.5 mm incisions. *J Cataract Refract Surg* 1998; 24: 509-14.

8. Nielsen PJ. Prospective evaluation of surgically induced astigmatism and astigmatic keratotomy effects of various self-sealing small incisions. *J Cataract Refract Surg* 1995; 21: 43-48.

9. Balent LC, Narendrum K, Patel S, Kar S, Patterson DA. High volume sutureless intraocular lens surgery in a rural eye camp in India. *Ophthalmic Surg Lasers* 2001; 32: 446-455.

10. State of the World's Sight (Estado de Salud Visual Mundial)—Executive summary—September 2005. Available from <http://www.v2020la.com>. [Cited 2008, September 20].

11. Programa Nacional de Sanidad Ocular y Prevención de la Ceguera. February 28, 2006. Ministerio de Salud; Expediente 2002, 12619/06, 7.