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Innovative Applications for Affordable and Quality Cataract Surgery

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Abstract

Cataract is the commonest cause of blindness, about 90 per cent of affected population live in low income countries where only a few can afford premium surgeries and the rest left in darkness. Innovation alone can solve this problem. Methods: Innovative applications like cut razor blades with Jeweler-cutter, Povidone Iodine application (PI) in three stages, sterilized air, Triamcinolone assisted needling (TAN) are used in a prospective nonrandomized study in Eastern India.

Results: 2550 cataracts and 30 posterior capsular opacity (PCO) cases are cohorts. No statistically significant difference in visual outcome is observed when compared with premium surgical procedures. But cost and carbon footprints with our innovations are significantly lower.

Conclusion: Cataract is the most successful major surgery. Economic burden of both treatment and blindness is huge; $74 billion eye care market is much bigger than 1.6 billion visually deprived! Innovation only can bridge the gap.

Introduction

World is lagging far behind to ensure "right to sight" through the program named "VISION2020" initiated by the world health organization in 1999[1]. Even after two decades 1.6 billion people are suffering from moderate to severe vision loss [2](Best corrected visual acuity in better eye 6/18> to 3/60 or less) Proper timely interventions can make this problem avoidable in 85% cases. Prevalence of blindness varies based on socioeconomic development as evidenced by the fact that 90% of this visually challenged people live in low income countries.

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Eye care market stands at 74 billion **USD** with a CAGR of more than 3%. [Vision care market –global outlook and forecast 2019-2024.Research and markets.com March22.2019 (Accessed on13.11.2019)]
This global vision care market is driven by newer diagnostic and advanced [3]equipments mostly dominated by fashionable and lucrative premium eye-care products which is beyond the reach of most needy population.[3]

Technological advancements are the cornerstone of "evolution" but right to sight must not be neglected. Cataract and uncorrected refractive errors are responsible for more than 60% visual deprivation.[4]Innovative approaches can only provide affordable quality eye care to the masses.
Aim of this study is to analyse the effects of innovative approaches in both primary and secondary cataract cases (also known as posterior capsular opacity (PCO). WHO-CHOICE (Choosing interventions that are cost-effective) is the theme behind this study.

Study design: Prospective interventional study

Methods

All the cataract cases coming to a 910 bedded multispecialty hospital in India from November 2016 – March 2018 are included in this study. Camps organized at Lions Club hospital were also included. Cases were done by single surgeon with standard manual small incision cataract surgery (SICS) without sutures. Same types of Acrylic hydrophobic lenses were used except in camps where Polymethyl methacrylate (PMMA) single piece lenses were used. Power was calculated day before surgery along with routine investigation. Uncontrolled diabetes and hypertensive cases were taken up only after control. Basically there were no exclusion criteria. Equal number of age and sex matched controls were taken who had undergone phaco-emulsification.

Cases coming with PCO during that period were another group where pars plana posterior capsular needling was done under topical anesthesia. However it was not randomized.
Innovations used: use of autoclaved razor blades cut with "Jwellers –cutter". Each blade can be cut into 10 pieces (Illustration 1) thus eliminating the need for other disposable knives (viz. Bard –Perker, Diamond, Sideport, Keratome etc)

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Intracameral antibiotics are now very common in use which increases the cost of surgery. Three stage 5% Povidone iodine is used as described here: stage1) in the pre-op room, after anasthesising conjunctval sac with topical anesthesia Povidone iodine is instilled in inferior cul de sac. Local anesthetics (peribulbar block) are injected surface (lid and adenexa) treatment with povidone iodine. Stage:2)On operation table ,same procedure is repeated followed by reusable sterilized draping and after putting speculum second application of PI is done in conjunctival cul de sac. Upper bulbar conjunctiva and cornea are wiped of excess PI.3) Third application was at the completion of surgery before putting eye patch. (Illustration 2)
Innovations have greatest role to tide-over any crisis. During Surgical complications causing posterior capsular rent, Triamcinolone Acetonide (TA) injection in anterior chamber can help to detect presence of vitreous by chemo staining. This facilitates open sky vitrectomy with subsequent reduced inflammatory response.(Illustration:3) Air is used in anterior chamber to clean up remaining vitreous, if any. Sterilised air is taken from empty glass vials which are autoclaved. (Illustration 4)

Paradise is lost again when PCO develops. All cases coming with best corrected visual acuity of less than 6/12 or two line reduction from best achieved visual acuity after cataract surgery were included in this study. Needling of PCO was performed by 26 G needle on 2 cc syringe either through limbal route (for sulcus fixated IOLs) or pars plana route (for in-the-bag fixated IOLs). (Illustration: 5)

Statistical analysis was done on Graphpad.com.

Results

2550 cases of SICS were included and compared with similar number of cases done with phacoemulsification or without innovative applications. No significant differences was seen in visual outcome ($p>0.8$).Cost was significantly less ($p<0.05$).

Moreover carbon footprints were significantly less as less disposable items were used (not in purview of this article).

Total 30 cases of PCO (secondary cataracts) who underwent needling were included in this study. Results were better when compared to YAG laser posterior capsulotomy ($p<0.05$). Cystoid macular edema was common after Yag laser.

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Three cases of decentered IOLs could be re-centered during TAN Pigment clumps deposited on anterior IOL surface could be removed without pitting as seen with YAG laser. Four cases of non proliferative diabetic retinopathy with clinically significant macular edema with PCO were treated successfully with TAN and IVTA. Mean visual gain was 2 lines without any complications. No infection or raised IOP was noted.

Discussion

Different studies has shown manual SICS and Phacoemulsification give comparable results in cataract surgery. Visual outcome, recovery time and other parameters do not show significant difference.[5.6] But accessibility affordability and learning curve along with huge cost implications could be the stumbling block to "Right to sight".

Cost reduction was done by using razor blades cut with "Jeweler's cutter" which are auto-cleavable still maintaining sharpness .This reduces carbon foot print which could be first step towards green cataract surgery.

Chemostaining of vitreous if prolepses during complicated cataract surgery to help in open sky vitrectomy and prevent post-op inflammation. This essentially eliminates use of pneumatic vitrectomy machine with expensive "ocutome".[7, 8]

TAN can be used successfully even during early postoperative period whereas YAG laser poses risk of retinal complications if done within six months or myopic eyes. PCO in NPDR with CSME cases is managed successfully with TAN combining with IVTA. This procedure is beneficial in tackling decentration of IOL due to capsular contraction.

This study has proven efficacy of innovative applications in cataract surgery to make affordable for masses without compromising quality and reducing carbon footprints.

Conclusion

Cataract surgery is regarded as most successful major surgery performed in the world. But success should not be measured by number or statistics alone unless it can substantially improve quality of life of the masses.

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Reduced vision makes people less productive, increasing economic burden by affecting gross domestic product (GDP).[12]

1.6 billion people are suffering from moderate to severe visual loss (6/18 to 3/60 in better eye). About 85 per cent are avoidable but that needs huge macroeconomic infrastructure which is not available as 90 per cent of this visually challenged people live in low income countries.

Advance technology is the propelling fuel of evolution of mankind but for huge price.

Innovation alone can solve as it encompass passionate commitment from seemingly illogical ideas to logical conclusion.[13]

Our study on providing low-cost affordable quality eye care in the form of innovative applications in cataract surgery and tackling commonest problem of posterior capsular opacity can be a guide to ensure "right to sight " to the world population. This will also reduce carbon footprints making way for green cataract surgery.

1. Pizzarello L, Abiose A, Ffytche T, et al. VISION 2020: The right to sight: A global initiative to eliminate avoidable blindness. Archives of Ophthalmology. 2004;122(4):615-620

2. Fricke TR, Tahhan N, Resnikoff S, et al. Global Prevalence of Presbyopia and Vision Impairment from Uncorrected Presbyopia: Systematic Review, Meta-analysis and Modelling. Ophthalmology. 2018;125(10):1492-1499

3. Bourne RR, Stevens GA, White RA, et al. Causes of vision loss worldwide, 1990-2010: A systematic analysis. The Lancet Global Health. 2013;1(6):e339-e349

4. World Health Organization. Blindness and Vision Impairment Prevention. Available from: http://www.who.int/blindness/causes/priority/en/index3.html [Accessed: Nov11, 2019]

5. Ruit S, Tabin G, Chang D, et al. A prospective randomized clinical trial of phacoemulsification vs. manual suture less small-incision extra capsular surgery in Nepal. Am J Ophthalmol 2007; 143:23–31.

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6. Gogate, P.M., Kulkarni, S.R., 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: 869–874

7. C.M. Jermak, et al. Triamcinolone Acetonide in Ocular Therapeutics. Survey of Ophthal. Vol. 52 No.5 SEPTEMBER–OCTOBER 2007

8. Dr Sanjoy Chowdhury: TAN. Presented at AAO2006, AIOC2007, JH0SCON2008

9. WU Pei-Chang Risk of endophthalmitis after cataract surgery using different protocols for povidone-iodine preoperative disinfection. Journal of ocular pharmacology and therapeutics.2006, vol. 22, pp. 54-61

10. Venkatesh R, van Landingham SW, Khodifad AM, Haripriya A, Thiel CL, Ramulu P, Robin AL. Carbon footprint and cost-effectiveness of cataract surgery. Curr Opin Ophthalmol. 2016 Jan; 27(1):82-8.

11. DS Morris, T Wright, JEA Somner A Connor. The carbon footprint of cataract surgery. Eye (2013) 27, 495–501

12. Köberlein J, Beifus K, Schaffert C, et al. The economic burden of visual impairment and blindness: a systematic review. BMJ Open 2013;3:e003471. doi:10.1136/bmjopen-2013- 003471

13. Baltussen R,Sylla M,Mariotti SP. Cost effective analysis of cataract surgery :a global and regional analysis.Bulletin of the WHO 2004,82:338-345

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Illustration: 1. Making blades with Jeweller's Cutter, autoclaved, fixed on handle: ready to use thus avoiding disposable knives. ***Cost reduction >50 x Carbon reduction >5x (The carbon footprint for one cataract operation was 181.8 kg CO_2eq.[11] In our study it is 36 kg)***

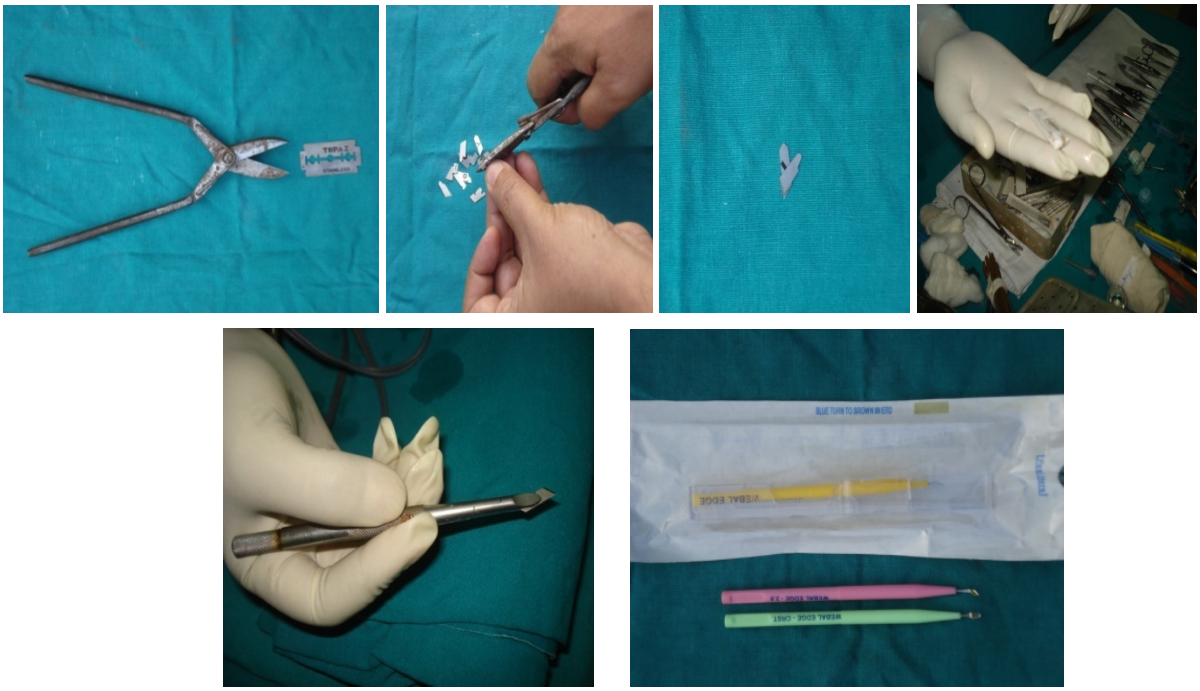

Illustration: 2. Chemstaining of Vitreous in anterior chamber with Triamcinolone

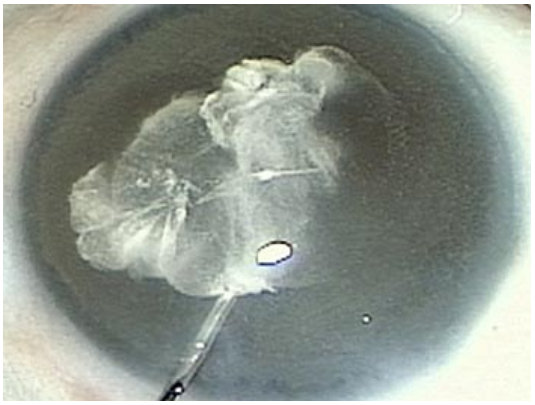

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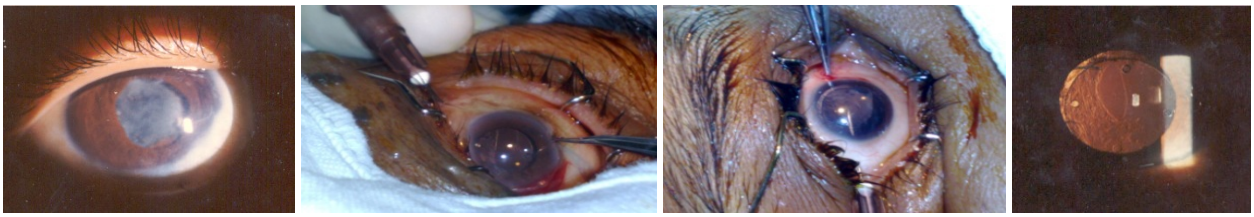
Illustration: 3. Three stages Povidone Iodine (PI) Application

Illustration: 4. STERILISED AIR FOR SURGICAL USE

Illustration: 5.Triamcinolone Assisted Needling (TAN)



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