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Hydroprocedures- The Miracle Tool of Phacoemulsification: Visual Outcome and Complications of Fifteen Cases of Phacoemulsification Performed in a Regional Institute of Ophthalmology

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ABSTRACT

Introduction: It has been our observation that in phacoemulsification many layers of hydrodelineation help in naturally cleaving the natural crystalline lens layer by layer. Subsequent emulsification of each layer is easy. The remaining epinuclear and cortical plate is easy to remove by repeating hydrodissection or hydrodelineation as required.

Aim: The aim of this study has been to document the visual outcome and complications of fifteen cases of phacoemulsification of patients with nuclear sclerosis one and two using multiple layers of hydrodelineation performed at our Regional Institute of Ophthalmology.

Methodology: Fifteen patients having visually significant cataract with nuclear sclerosis one and two were enrolled in our study. Phacoemulsification was performed in all fifteen eyes via the temporal approach. We created multiple waves of hydrodelineation at deeper nuclear levels as identified on the slit lamp examination as natural layers of the endonucleus at approximately one mm depth intervals. Thus we created as small a central nuclear chunk as possible. This was then held by the phaco probe and directly chopped and emulsified. The remaining nuclear, epinuclear and cortical layers were removed layer by layer via gripping with phaco probe at edge of shell and subsequently emulsifying the layer. The other steps were as per protocol .

Results: All the fifteen patients had good postoperative visual recovery with no major intraoperative or postoperative complications for the reported period of six weeks.

Discussion: We report successful phacoemulsification using multiple layers of hydroprocedures to “divide” the nucleus along its natural cleavage planes followed subsequently by emulsification.

Conclusion: We report successful phacoemulsification using multiple layers of hydroprocedures to “divide” the nucleus along its natural cleavage planes followed subsequently by emulsification.

Key Words: Hydroprocedures, Phacoemulsification, Layer by layer

INTRODUCTION

It has been our observation that in phacoemulsification many layers of hydrodelineation help in naturally cleaving the natural crystalline lens layer by layer. Subsequent emulsification of each layer is easy. The remaining epinuclear and cortical plate is easy to remove by repeating hydrodissection or hydrodelineation as required. This increases safety levels as there is always a plate of epinucleus to protect the posterior capsule. We have found this to be a safe method for early cataracts as nuclear sclerosis one and two grade as well as posterior polar cataract. This method has been documented for posterior polar cataracts but not for nuclear sclerosis type of cataracts.[1]

We designed a study to document the visual outcome and complications of fifty cases of phacoemulsification using many layers of hyrdodelineation followed by emulsification.

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The cases were performed at our Regional Institute of ophthalmology by a single experienced surgeon.

The crystalline lens is a highly ordered structure with a close orderly packing of lens fibre cells. The lens has an elliptical shape and occupies the space between the iris and the vitreous. It is held in a fairly fixed position by the zonular fibres that run from the lens to the ciliary body and by its close approximation to the vitreous on its posterior and equatorial sides. The lens fibres with their highly organized concentric shells make up the bulk of the lens.

In infants the cortical lens cells surrounding the fetal nucleus are nucleated. As new cells form the older ones are displaced deeper into the cortex and lose their nuclei. The deeper cells lose their nuclei and their outlines become less defined. By thirty years of age a considerable number of older cells have accumulated to form the lens nucleus. The cells comprising the lens cortex surround the nucleus and many of them retain their nuclei. The cells of the lens cortex and nucleus have come to be known as lens fibres because of their length. Cells from the equator migrate towards the anterior and posterior poles.

We have observed that the colour of the lens including the capsule, cortex, epinucleus and nucleus deepens or darkens progressively as we move from anterior to posterior. Authors have observed and correlated the hardness of the lens with its colour. It is mentioned that as there is synthesis of secondary lens fibres, cells from the equator migrate towards anterior and posterior poles, pushing the older cells deeper .Thus the lens is formed in concentric layers.

Hydroprocedures are a documented step of phacoemulsification. Fine's cortical cleaving hydrodissection is in the plane between the cortex and the capsule. There is a plane between cortex and nucleus seen as a dark zone in early nuclear sclerosis grade one and two cataracts. Definite mention has not been made of this zone in texts. A plane of fluid wave has to be passed in this zone. There is another dark zone between the epinucleus and the endonucleus. A fluid plane is also created in this zone. Within the endonucleus too there are concentric arrangement of lens fibres which may be cleaved by planes of fluid.

The term hydrodelineation was introduced by Anis to describe the act of separating an outer epinuclear shell or multiple shells from the compact inner nuclear material, the endonucleus by forceful irrigation of fluid into the inner nuclear mass.

It has been our observation that although the cortex, epinucleus and endonucleus are concentric still the posterior cortex, epinucleus and endonucleus are browner than the anterior counterparts as if we could draw a vertical line from the superior equator to the inferior equator to divide the lens into two zones, an anterior softer zone and a posterior harder zone. We also observed that not only the nucleus colour but also the compactness of the lens matter observed on slit lamp biomicroscopy may contribute to its hardness.

In phacoemulsification after capsulorrhexis we remove the anterior cortex ,epinucleus and superficial endonucleus by aspiration alone and it comes easily. The posterior endonucleus, epinucleus and cortex are left. The posterior endonucleus (the core lens matter) is held with the phaco probe and alternately vertically chopped and emulsified. The softer lens layers are the gripped and emulsified/aspirated layer by layer. The remaining cortex is removed by irrigation- aspiration.

AIM

The aim of this study has been to document the visual outcome and complications of fifteen cases of phacoemulsification of patients with nuclear sclerosis one and two using multiple layers of hydrodelineation performed at our Regional Institute of Ophthalmology.

METHODOLOGY

The study was carried out at our Regional Institute of Ophthalmology from January 2017 to April 2017. Fifteen patients with visually significant cataract with nuclear sclerosis one and two were enrolled in our study. All patients were subjected to a thorough anterior and posterior segment examination, intraocular pressure measurement and intraocular lens power calculation.

Phacoemulsification was performed in all fifteen eyes via the temporal approach. A side port was made with microvitreoretinal blade on the right hand side of the surgeon .1.4% sodium hyaluronate was then injected into the anterior chamber. Capsulorrhexis was performed using a 26 and half guage needle. Another side port was then made at 180 degrees to the first port with a microvitreoretinal blade. Main port was then made using a 3.2 mm keratome at the temporal side. Fine's cortical cleaving hydrodissection was then carried out using a 27 guage hydrodissection cannula filled with normal saline mounted on a 5 ml syringe. The anterior capsule edge was lifted and freed from the underlying cortex for one mm. The edge was lifted and fluid was injected .The end point of hydrodissection was determined by completion of the fluid wave and lifting up of the nucleus. The nucleus was gently pushed posteriorly. The cannula was then inserted into the cortex and the epinucleus and fluid was injected at the first point of resistance. The end point was noted as completion of the fluid wave and appearance of a golden rim.

Subsequently we created multiple waves of hydrodelineation at deeper nuclear levels as identified on the slit lamp exami-

nation as natural layers of the endonucleus at approximately one mm depth intervals. Thus we created as small a central nuclear chunk as possible. This was then held by the phaco probe and directly chopped and emulsified.

Thereafter the remaining nuclear, epinuclear and cortical layers were removed layer by layer via gripping with phaco probe at the edge of the shell and subsequently emulsifying the layer.

Phacoemulsification was completed thus in all the fifteen eyes . Foldable intraocular lens was then implanted under the cover of 1.4% sodium hyaluronate in the capsular bag. Viscoelastic wash was carried out followed by wound closure.

All patients were examined on first postoperative day. Best corrected visual acuity was documented along with intraocular pressure. Thorough anterior segment examination was carried out using slit-lamp biomicroscopy. The patients were followed up on day four, 2 weeks, four weeks and 6 weeks. Final best corrected visual acuity was documented at six weeks. Thorough anterior segment and dilated posterior segment examination was done to account for best corrected visual acuity less than 6/6.

RESULTS

All the fifteen patients had good postoperative visual recovery with clear cornea and intraocular lens in place and a round, regular reacting pupil on first postoperative day. The best corrected visual acuity at 6 weeks postoperative was 6/6 in 12 patients. Two patients had best corrected visual acuity of 6/18 due to dry age related macular degeneration changes. One patient had a best corrected visual acuity of 6/36 due to macular dystrophy.

There were no major intraoperative or postoperative complications for the reported period of six weeks.

DISCUSSION

We report successful phacoemulsification using multiple layers of hydroprocedures to “divide” the nucleus along its natural cleavage planes for grade one and two nuclear sclerosis cataracts followed subsequently by emulsification.

Vajpayee RB et al first reported ‘ Layer by layer ’ phacoemulsification in posterior polar cataract with pre-existing posterior capsular rent. They described the technique as a single ring of hydrodelineation to separate the inner nucleus from the superficial epinucleus and cortex .[1] The inner firm nucleus was phacoemulsified. Each layer of epinucleus and cortex was sequentially aspirated in layers using an automated bimanual irrigation and aspiration cannula. They reported successful phacoemulsification followed by implantation of a foldable intraocular lens in the bag.

We document this same procedure for nuclear sclerosis grade one and two cataracts. The procedure reduces the amount of phaco energy used as we are emulsifying a small nucleus. The softer layers can be taken by aspiration alone. The procedure keeps the posterior capsule protected by its layers of softer lens material till nucleus management is done.

The procedure is a safe and effective addition to the current armamentarium of phacoemulsification procedures and complements them.

CONCLUSION

We report successful phacoemulsification of nuclear sclerosis grade one and two cataracts using multiple layers of hydroprocedures to “divide” the nucleus along its natural cleavage planes followed subsequently by emulsification. The procedure has been previously reported for posterior polar cataracts.

We document this procedure in early nuclear sclerosis cataracts. This procedure represents a safe and effective addition to the current armamentarium of phacoemulsification methods.

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REFERENCES

1. Jaffe NS, Jaffe MS, Jaffe GF. Surgical Anatomy. In: Jaffe NS, Jaffe MS, Jaffe GF. Cataract Surgery and its Complications. 6th Ed. Mosby;1997. p 48-51.
2. Schell J, Boulton ME. Basic Science of the Lens. In: Yanoff M, Duker JS, editors. Ophthalmology.4th Ed. China: Elsevier Saunders;2009. p 329.
3. Jaffe NS, Jaffe MS, Jaffe GF. Surgical Technique. Hydrodissection and Hydrodelineation. In: Jaffe NS, Jaffe MS, Jaffe GF. Cataract Surgery and its Complications.6th Ed.Mosby;1997.p72.
4. Packer M. Hydrodissection and Hydrdelineation .Small Incision and Femtosecond Laser Cataract Surgery. In: Yanoff M,

Duker JS, editors. Ophthalmology.4th Ed. China: Elsevier Saunders;2009. p 372.

5. Packer M. Nucleofractis Techniques. Small Incision and Femtosecond Laser Cataract Surgery. In: Yanoff M, Duker JS, editors. Ophthalmology.4th Ed. China: Elsevier Saunders;2009. p 372-373.
6. Vajpayee RB, Sinha R, Sanghvi A, Sharma N, Titiyal JS, Tandon R. 'Layer by layer ' phacoemulsification in posterior polar cataract with pre-existing posterior capsular rent. Eye 2008;22:1008-1010.