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Original scientific paper

Clinical Importance of The Lens Opacities Classification System III (LOCS III) in Phacoemulsification

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A B S T R A C T

The aim of this study was to compare the correlation of features of cataracts graded by the Lens Opacities Classification System, version III (LOCS III) with recorded operative characteristics during the phacoemulsification. The retrospective study included 245 cases operated on by a single surgeron from October 2003 to March 2004. The cataract was graded at the biomicroscope using the 4 grading scales of the lens opacities classification sistem, version III (LOCS III); nuclear opalescence (NO), nuclear color (CO), cortical cataract (C) and posterior subcapsular catract (P). We recorded 2 intraoperative characteristics: machine masured phacoemulsification time, and average machine power. The machine recorded phacoemulsification time and average power correlated positively with the estimated nuclear color (NC) scale and nuclear opaclescence (NO) scale. Grading within categories of cortical catract (C) and posterior subcapsular cataract (P) did not correlate with any of the operative variables. Exponentially, greater phacoemulsification energy was required as NC and NO increased. LOCS III grading system enables the surgeon to anticipate potential pitfalls and to adapt the operative technique to the individual patient.

Key words: *lens opacities, classification, phacoemulsification*

Introduction

Cataract classifications based on »maturity« of the cataract, degree of opacification or progression are not sufficient in any epidemiological or therapeutic cataract study. The Lens Opacities Classification System III (LOCS III) is a standard system used for grading and comparison of cataract severity and type[1–2]. It was derived from the LOCS II classification[3], and it consist of three sets of standardized photographs (Fig. 1). The classification evaluates four features: nuclear opalescence (NO), nuclear color (NC), cortical cataract (C), posterior subcapsular cataract (P). Nuclear opalesecence (NO) and nuclear color (NC) are graded on a decimal scale of 0.1 to 6.9, based on a set of six standardized photographs. Cortical cataract (C) and posterior subcapsular cataract (P) are graded on a decimal scale of 0.1 to 5.9, based on a set of five standardized photographs each. Unlike LOCS II classification, the LOCS III classification narrowed scaling intervals, allowing small changes in cataract severity to be observed. 95% tolerance limits for within-grader and between-grader reproducibility were also narrowed in the LOCS III classi-fication[1].

Phacoemulsification was invented by Charles Kelman in 1960's as a technique for operating cataracts. It offers considerable advantages over extracapsular cataract extraction technique (ECCE). Smaller incision reduces healing time, minimizes postoperative astigmatism, and enables faster visual recovery for the patient. However, phacoemulsification technique requires careful and detailed preoperative planning, because cataract features influence phacoemulsification power and time, and even the smallest details play an important role in the success of the operation[4].

The aim of our study was to compare the LOCS III characteristics of cataracts with average phacoemulsification power and time.

Patients and Methods

We retrospectively analyzed records of 245 consecutive patients with cataract, and no associated ocular disease, who underwent phacoemulsification and foldable

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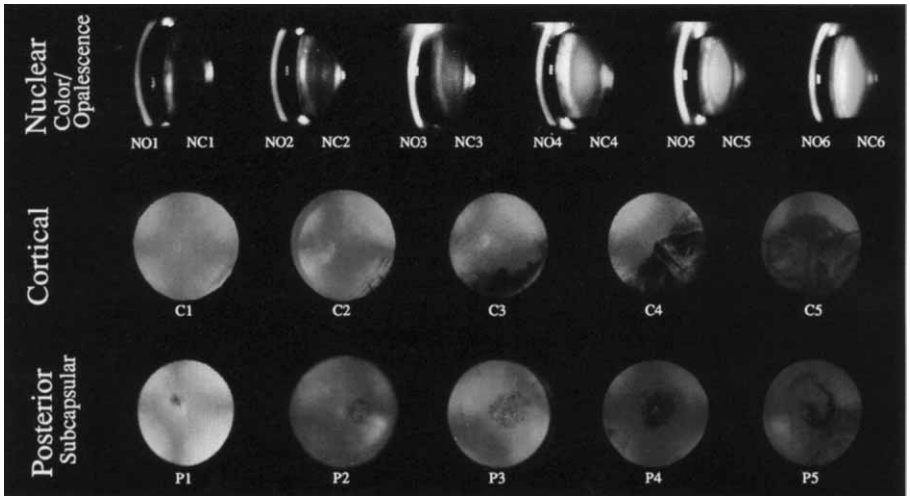

Fig. 1. The LOCS III standardized chart showing graded nuclear opalescence/nuclear color in the top row, cortical cataract in the middle row, and posterior subcapsular cataract in the bottom row.

intraocular lens implantation from October 2003 until March 2004. We performed ophthalmologic examination in all patients, which included best corrected visual acuity (BCVA), applanation tonometry, slit lamp examination, and fundus examination. Cataracts were graded at the slit lamp by two independent observers, and the findings were compared with the standardized LOCS III classification. Each graded cataract was then assessed for between-grader reproducibility. Phacoemulsification was performed in all patients by one surgeon (Z.M.), and machine-measured phacoemulsification time as well as average machine-measured power were recorded during the surgery.

A clear cornea incision was created, to follow with continuous curvilinear capsulorhexis, and hydrodissection. Sodium hyaluronate (Healon GV, Pharmacia, Uppsala, Sweden) was injected in the anterior chamber. Phacoemulsification was done in the capsular bag using either »divide and conquer« or »quick chop« technique, followed by the irrigation/aspiration of the remaining cortical lens material. After injecting more sodium hyaluronate (Healon GV) in order to deepen the capsular bag, a foldable acrylic intraocular lens (Acrysof, Alcon, Forth Worth, TX, USA) was implanted in the posterior chamber.

Regression analysis was performed using the SPSS 9.0 for Windows, and coefficient of determination ($R^{2)}$ calculated for each of the evaluated parameter and cataract type.

Results

A total of 27 out of 245 patient records had incomplete data sets, and were therefore excluded from the statistical analysis. In 218 patients cataracts graded at the slit lamp by two independent observers were assessed for between-grader reproducibility. On average, the 95% confidence interval for each scale was 0.65, which was consistent with the original LOCS III publication.

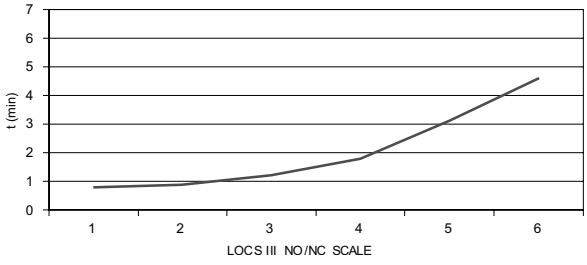

Fig. 3. Correlation between average ultrasound time (t) and nuclear opacification/nuclear color scale (R^2=0,457).

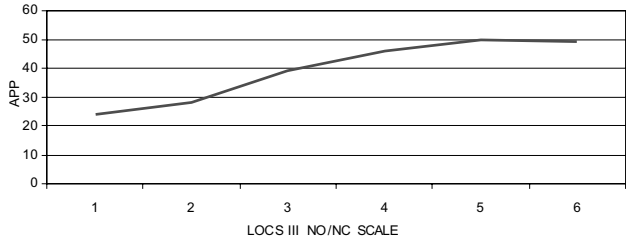

Fig. 2. Correlation between average phacoemulsification power and nuclear opacitiy / nuclear color scale (R^2 =0,174).

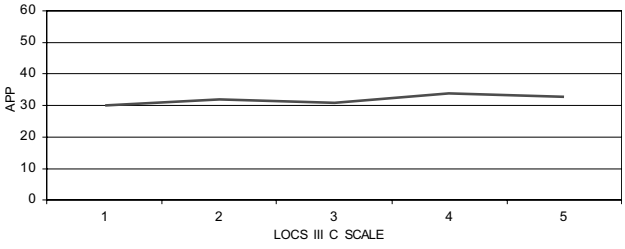

Fig. 4. Correlation between average phacoemulsification power and cortical opacification scale (R^2=0,0148).

Average phacoemulsification power and average phacoemulsification time positively correlated with the nuclear opalescence / nuclear color scale (Figures 2 and 3). Moreover, the relationship between average phacoemulsification time and nuclear opalescence/nuclear color was exponential (R^2=0.457).

Cortical and posterior subcapsular cataracts showed no correlation with either average phacoemulsification power, or average phacoemulsification time (Figures 4–6).

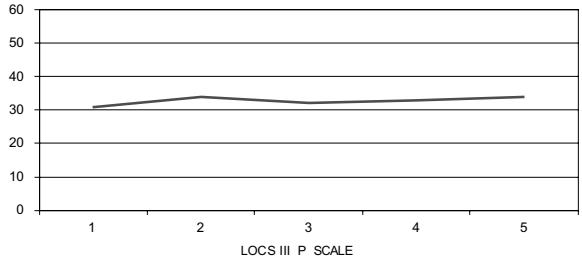

Fig. 5. Correlation between average phacoemulsification power (APP) and posterior subcapsular opacification scale (R^2=0,0122).

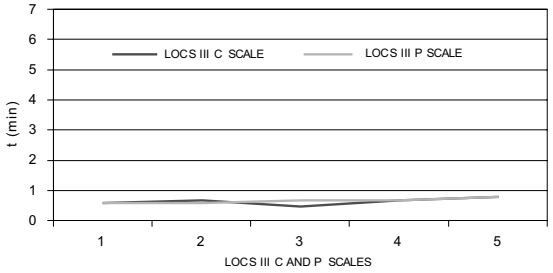

Fig. 6. Correlation between average ultrasound time (t) and cortical / posterior subcapsular opacification scale. (R_1^2=0,0244, R_2^2=0,0277).

Discussion

The results of our study showed that LOCS III features nuclear color/nuclear opalescence positively correlated with average phacoemulsification power and average phacoemulsification time. There was no correlation between cortical cataract, subcapsular cataract and the studied phacoemulsification parameters. One of the most important features in phacoemulsification is the extent of nuclear hardness. We observed a linear relationship between average phaco power/time and nuclear opalescence/color up to, and including grade four. For higher grades of nuclear opalescence/color the average phaco power and time rose almost exponentially.

Davison observed in a similar study that greater phacoemulsification energy was required with the increase of nuclear opacification/color[5]. Another study showed that phacoemulsification energy recorded by total delivered energy as well as by postoperative anterior chamber flare correlated with LOCS III NO/NC[6]. Our results suggest a possible increase of intraoperative and postoperative complications, especially in predisposed patients, with nuclear cataract. Based on LOCS III characteristics of cataract, the surgeon can choose the appropriate surgical procedure that will be the least risky for the patient, and give less surprises at the operating table for the surgeon. Incorporating LOCS III classification into patient records allows better clinical documentation of cataract progression, decreases the subjective influence from different observers, and enables the creation of a customized preoperative planning for each patient.

REFERENCES

1. CHYLACK, L. T., J. K. WOLFE, D. M. SINGER, M. C. LESKE, M. A. BULLIMORE, I. L. BAILEY, J. FRIEND, D. MC CARTHY, S. Y. WU, Arch. Ophthalmol., 111 (1993) 831. — 2. KARBASSI, M., P.M. KHU, D. M. SINGER, L. T. CHYLACK, Optom. Vis. Sci., 70 (1993) 923. — 3. CHYLACK, L. T., M. C. LESKE, D. MC CARTHY, P. M. KHU, T. KASHIWAGI, R. SPERDUTO, Arch. Ophtalmol., 107 (1989) 991. — 4. BURATTO, L., P. BARBONI, R. FIRRINCIELI: Developments in cataract surgery. In: BURATTO, L., L. WERNER, M. ZANINI, D. APPLE (Eds.): Phacoemulsification principles and techniques. (Slack Incorporated, New Jersey, 2003). — 5. DAVISON, J. A., L. T. CHYLACK, J. Cataract. Refract. Surg., 29 (2003) 138. — 6. URSELL, P. G., D. J. SPALTON, K. TILLNG, Br. J. Ophthalmol., 81 (1997) 544.

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KLINIČKI ZNAČAJ LOCS III KLASIFIKACIJE KATARAKTE KOD FAKOEMULZIFIKACIJE

S A Ž E T A K

Cilj studije bio je usporediti odnos između značajki katarakti stupnjevanih prema Lens Opacities Classification System, version III (LOCS III) sa zabilježenim intraoperativnim značajkama tijekom fakoemulsifikacije. U retrospektivnu studiju smo uključili 245 slučajeva operiranih od istog kirurga od listopada 2003. do ožujka 2004. Katarakta je stupnjevana na biomikroskopu koristeći 4 karakteristike LOCS III klasifikacije; zamućenje nukleusa (NO), boja nukleusa (NC), kortikalna katrakta (C), stražnja supkapsularna katarakta (P). Pratili smo dvije značajke tijekom operacije katarakte: vrijeme fakoemulzifikacije i prosječnu snagu fakoemulzifikatora.Vrijeme fakoemulzifikacije i prosječna snaga fakoemulzifikatora korelirali su pozitivno s procijenjenom jačinom zamućenja nukleusa (NO) kao i boje (NC). Stupnjevanje kortikalne (C) kao i stražnje supkapsularne katarakte (P) nije koreliralo ni s jednom od mjerenih varijabli. Jače zamućenje nukleusa i boje nukleusa zahtijevali su eksponencionalno povećanje snage fakoemulzifikatora. Klasifikacija katarakte prema LOCS III sustavu omogućava operateru predviđanje potencijalnih zamki i individualnu prilagodbu operativne tehnike.