Association Between Mortality and Early Post-operative Ambulation After Distal Femur Fracture Fixation in Elderly Patients

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Comparison of Multiple IOL Power Calculation Formulas Using Keratometric Data From a Scheimpflug Camera vs. Swept-Source OCT
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Program: Ophthalmology
Type: Original Research

Background: IOL calculation formulas can use multiple different metrics to run their calculations before cataract surgery. The purpose of this study was to analyze the accuracy of multiple intraocular lens power calculation formulas using the IOL Master 700 keratometry (K) and total K (TK) measurements metrics and the Pentacam K and equivalent K readings (EKR).

Methods: This was a retrospective analysis of consecutive patients submitted to phacoemulsification. Inclusion criteria were patients with good quality scans from both devices on the same day, visual acuity of 20/40 or better at the 1-month postoperative visit, and no surgical complications. Patients with previous surgery, other ophthalmic disorders, and history of eye trauma were excluded. Initial screening identified 45 out of 59 eligible patients. Only one eye per patient was included. Assessment compared the keratometric data among devices and each formula's mean absolute error (MAE) using different keratometric input and patients within 0.25 D, 0.50 D and 1.00 D of the predicted error. Postoperative refraction was assessed at one month postoperatively.

Results: Keratometric variables were normally distributed, and a repeated measures ANOVA was found to be statistically significant (p < 0.01). Post-hoc analysis showed a statistical difference between IOL Master K and TK (p < 0.01) and the IOL Master TK and Pentacam EKR (p < 0.01). Regarding the IOL formulas calculation, the EVO IOL Master K performed best (± 0.50 D = 96%, MAE = 0.24 D), followed by the Pearl DGS TK (± 0.50 D = 93%, MAE = 0.21 D) and the Pearl IOL Master K (± 0.50 D = 93%, MAE = 0.26 D).

Conclusion: Formula choice should take into consideration which keratometric values are being used. Also, using Pentacam K, especially the EKR, did not improve any formula accuracy. Future analysis will include optimization of A-constants, assessment other IOL types, and stratification of subjects by groups of interest.

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Analyzing Skull Base Imaging Using Machine Learning to Predict the Risk of Spontaneous CSF Leak

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**Type:** Original Research

**Background:** Elevated intracranial pressure (EIP) and idiopathic intracranial hypertension (IIH) are associated with erosion of the skull base, which may lead to spontaneous CSF leak or encephalocele. Prior research has identified expansion of the foramen ovale (FO) as a radiologic marker associated with IIH, spontaneous CSF leak, and encephalocele. We hypothesized that a convolutional neural network (CNN) could be trained to identify and measure the FO to identify patients at high risk of IIH or spontaneous CSF leak.

**Methods:** CT studies from 295 normal patients were manually segmented using 3D Slicer to train a CNN using the U-Net architecture for imaging segmentation. We evaluated the accuracy compared to manual measurements of the FO in a dataset of 264 patients with IIH, CSF leak, or encephalocele that were obtained by 2 observers using digital calipers.

**Results:** The CNN performed estimations of the FO area that were different by a mean of 0.4 to 0.5 mm² (1.8 to 2.2% of the foramen area) from the manually segmented foramen measurements of the same imaging studies. This compared favorably with the manual measurements of the FO in the dataset of 264 patients, which had an intraclass correlation coefficient between the 2 observers of 0.85 (95% CI 0.81-0.88).

**Conclusion:** Automated segmentation using a CNN is an accurate and efficient method for measurement of the FO. Early identification of patients at high risk of recurrent CSF leak after surgical repair due to EIP using non-invasive methods could improve management by identifying patients in need of additional workup and treatment.

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Medications Affecting Hearing in Patients Undergoing Radiotherapy for Vestibular Schwannoma

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**Type:** Original Research

**Background:** Patients with Vestibular schwannoma (VS) undergoing definitive radiotherapy (RT) for the purpose of hearing preservation commonly experience hearing loss due to effects from both tumor and treatment; however, there is limited data evaluating the associated role of concurrent medications in hearing preservation during RT.

**Methods:** The baseline and post-treatment audiograms of consecutive patients who underwent definitive RT for VS between 2004 and 2018 were evaluated for hearing decline. We performed chi-squared analyses of the frequency of various clinicopathologic factors and t-tests evaluating the degree of hearing loss with the same factors. Patients without available audiograms were excluded.

**Results:** From 2004 to 2018, a total of 94 patients with concurrent medications listed were evaluable with both baseline and post-RT audiograms available for review. The most recent post-RT audiograms were recorded at a median of 35.7 months following RT which showed a mean increase in pure tone average (PTA) of 21.1 dB. A subset of 36 patients (38.3%) reported use of over the counter (OTC) analgesics (including acetaminophen and NSAIDs) during radiotherapy. The mean increase in PTA was significantly higher for patients taking OTC analgesics (25.7 dB vs 18.2 dB, p=0.030). OTC analgesic use remains a significant factor associated with PTA increase with multivariate analysis, and so does conventionally fractionated RT (CFRT). Patients taking OTC analgesics were more likely to be female than male (63.9% vs 36.1%, p=0.050) and more commonly received single fraction stereotactic radiosurgery (SRS) than CFRT (25.0% vs 3.4%, p=0.006). No other evaluated clinicopathologic factor was associated with hearing loss.

**Conclusions:** We found OTC analgesic use during definitive RT to be associated with greater hearing loss over the treatment course. This suggests the ototoxic effects of analgesics may be additive to the ototoxic effects of radiotherapy. These results warrant further investigation.

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