

Research Activity and Contributions to Medical Literature.

Dr. Malcolm Ing

The following is a partial list of the research, publications and conclusions listed in chronological sequence by year in which Dr. Ing was the lead or sole author:

1. *First multi-center study to report the value of early surgical alignment for congenital esotropia.* Ing, M., Costenbader, F., Parks, M., et al. Early Surgery for Congenital Esotropia. *Am J Ophthalmol*, 1966; 61: 1419-27.
2. *First study of the racial distribution of strabismus in Asia-Pacific Region.* Ing, M., Pang, S. The Racial Distribution of Strabismus. *Hawaii Medical Journal*, 1974; 33: 2.
3. *First independent, multi-center study to establish a statistically significant ($p < 0.001$) difference in the binocular results of surgical alignment for congenital esotropia in favor of alignment before the age of 2 years compared to those aligned after 2 years of age). Author performed a masked examination of 106 patients for the study by traveling to 7 different medical centers.* (AOS thesis) Ing, M. Early Surgical Alignment for Congenital Esotropia. *Trans American Ophthal Soc*, 1981; 79: 625-63.
4. *First report on the incidence of infection following strabismus surgery from survey of the Costenbader Association members.* Ing, M. Infection following Strabismus Surgery. *Ophthalmic Surg*, 1991; 22: 41-43.

5. First independent study of the efficacy and functional outcome of Botulinum treatment of congenital esotropia. The author traveled to the offices of two pediatric ophthalmologists adept at utilizing Botulinum injections for congenital esotropia to personally perform a masked study of the best cases in the surgeons series, aligned by Botulinum. The author found that, although patients could be aligned by this treatment within the 2 year time window, the sensory result was inferior to a comparable series aligned by surgery ($p < .005$). Ing, M. Botulinum Alignment for Congenital Esotropia. *Trans Am Ophthalmol Soc*, 1992 90: 361-396.

6. First retrospective report on the progressive increase in the angle of deviation in the majority of 46 congenital esotropes while they were being followed during the first year of life. Ing, M. Progressive Increase in the Angle of Deviation in Congenital Esotropia. *Trans Am Ophthalmol Soc*, 1994; 31: 6-17.

7. First independent, masked, outcome study that showed that the sensory outcome in 11 congenital esotropia patients who were aligned at a mean age of 4.2 months of age showed a stereoacuity result, except for one patient, that was no better than that found in patients aligned by 6 months of age. The vast majority of the patients with very early alignment were shown to have a monofixation syndrome result with absent fine stereoacuity. The author traveled to 4 different medical centers to personally examine the patients of other surgeons with motor and sensory tests to obtain his findings. Ing, M. Outcome of Surgical Alignment before 6 months of age for Congenital Esotropia. *Trans Am Ophthalmol Soc*, 1995; 135-146.

8. The author performed a retrospective outcome study of 52 consecutive patients, evaluated at a mean of 4.4 years

following bilateral recession of the lateral recti for intermittent exotropia. This study showed that alignment at 6 months was highly predictive of overall success. In addition, it was found that, 10% of the patients had a monofixation syndrome result. Ing, M., Nishimura, J., Okino, L. Outcome Study of Bilateral Lateral Rectus Recession for Intermittent Exotropia in Children. *Trans Am Ophthalmol Soc*, 1997; 94: 433-452.

9. *The author performed an analysis of the patients in his independent, masked, outcome study that demonstrated that the attainment and quality of stereopsis in aligned congenital esotropes is related to the duration of misalignment rather than the age of alignment per se. The patients that had the least duration of misalignment, had the greater chance of developing stereopsis. Furthermore, those aligned with 6 to 12 months duration had a better quality of stereoacuity than those aligned after 12 months or greater duration of misalignment.* Ing, M., Okino, L., Rezentes, K. Outcome Study of Stereoacuity in Relation to the Duration of Misalignment. *J AAPOS*, 2002; 6: 3-8.

10. *The author performed an analysis of his masked, independent, outcome study of early surgery for congenital esotropia to examine the development of fusion in patients aligned with respect to duration of misalignment rather than age per se. It was found that the development of fusion was essentially the same for those who achieved alignment with 6, 12 and 24 months duration of misalignment. Therefore, it was found that the window of opportunity for patients to develop fusion was larger (up to 24 months) than the window to develop stereopsis (up to 12 months) in the same group of patients.* Ing, M., Rezentes, K. Outcome Study of the Development of Fusion in Patients Aligned for Congenital

Esotropia in Relation to Duration of Misalignment. *J AAPOS*, 2004; 8: 35-37.

11. *This author proposed and organized a randomized, multicenter, prospective IRB-approved study of the efficacy of alternating occlusion prior to surgical alignment. This study, organized with the assistance of the Smith-Kettlewell Eye Research Institute, did not show a significant difference in the one-year motor alignment results for patients with alternating occlusion versus no alternating occlusion before surgical alignment. Never the less, this study was the first multi-center prospective study of infantile esotropia to show a progressive increase in the angle of deviation ($p < 0.00027$).* Ing, M., Norcia, A., Stager Sr., D., Black, B., Hoffman, R., Mazow, M., Troia, S., Scott, W., Lambert, S. A Prospective Study of Alternating Occlusion Before Surgical Alignment for Infantile Esotropia: One-Year Postoperative Motor Results. *Trans Am Ophthalmol Soc*. 2005; 103:31-6.

12. *The first report of a novel method of treatment, utilizing electronic biofeedback to relieve pain from post herpetic neuralgia in three clinical cases.* Ing, M. The Use of Electronic Biofeedback for the Management of Post-Herpetic Neuralgia. *Hawaii Medical Journal* 2007; 66: 232-233.

13. *This is the first, independent, long term, multi-center study of the binocular results in children who have had bilateral cataract extraction and bilateral primary insertion of intraocular lenses by 4 different surgeons adept in this type of surgery. The author traveled to 4 different medical centers to personally examine the patients from a consecutive series to obtain the data. It was found that the most common outcome was a monofixation syndrome and that fine stereoacuity was uncommon.* Ing, M. Binocular Function in Pseudophakic Children. *Trans Am Ophthalmol Soc*, 2009; 107: 112-119.

14. *This investigator has organized an IRB-approved, prospective, randomized outcome study with 2 co-investigators, Hellreich, P. and Johnson, D .It is a study of 20 patients with intractable post herpetic neuralgia treated after randomization to treatment with a true electronic device compared to a sham device. The data has been analyzed and the study completed, but it is not yet published.*

Summary: With a group of independent studies, this author has influenced the management of congenital esotropia. Study #3 is considered a “landmark investigation” because it proved statistically in a masked, multi-center study that alignment by the age of 2 resulted in the attainment of fusion and stereopsis in a greater percentage of patients than patients aligned after the age of 2. Study # 5 showed that, although alignment could be obtained by injecting botulinum into the medial recti of infants, a greater percentage of comparable patients who were aligned by surgery in the sensitive period, showed sensory evidence of binocularity. Study # 6 was the first retrospective report of progressive increase in the angle of deviation in congenital esotropia. This finding of progressive increase in the angle of deviation was also confirmed in a prospective study (#11). The Studies #9 and #10, when assessed together, demonstrated that the time window for the attainment of stereopsis was shorter (up to 12 months) when compared to that for development of fusion(up to 24 months). These studies showed that the duration of the misalignment in congenital esotropia was more important than the age of alignment per se. Therefore, the shorter the duration of the misalignment, the greater the chance of the development of stereopsis and fusion in aligned patients. However, a study(#7) by this author has shown that there seems to be a limit on the fine stereoacuity result , because very early alignment (at 4 months) did not yield a

significantly larger amount of fine stereo results compared to those aligned at 6 months. Study # 11 which was designed to test the efficacy of alternating occlusion before surgical alignment, and, although there was no difference shown, it should be pointed out that this study was the second only multi-center, prospective study in the surgical management of strabismus(the other being the prism adaptation study). Study # 13 by this author is the largest long term multi-center study of the binocularity results in bilateral pseudophakia in children. This study demonstrated that the monofixation syndrome is the common binocularity result in these patients, much like it is the common result in surgically aligned congenital esotropes, provided that this alignment is achieved by age 2..

It should also be noted, also, that, except for studies # 11 and #14, all of these studies were *self-funded*.