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## Incidence of Idiopathic Intracranial Hypertension Parallels Rising Rate of Obesity

Data from the Centers for Disease Control and Prevention indicate that the prevalence of adulthood obesity in the United States, as defined by a body mass index of 30 kg/m<sup>2</sup> or more, has increased steadily — from 12.7 percent in 1980 to 34.9 percent in 2012.

Obesity is a major risk factor for idiopathic intracranial hypertension (IIH), a condition of increased intracranial pressure of unknown cause that often produces papilledema and vision loss. IIH occurs most typically in women in their childbearing years who are obese.

John J. Chen, M.D., Ph.D., and a research team from Ophthalmology at Mayo Clinic's campus in Rochester, Minnesota, wondered whether the incidence of IIH had risen in parallel with the epidemic of obesity. "Although

we know that obesity is a large risk factor for IIH, there have been no studies evaluating whether the incidence of IIH is rising with the increase in obesity," says Dr. Chen.

Much of the knowledge on the incidence of IIH came from a prior study from the Rochester Epidemiology Project, published in the *Archives of Neurology* in 1993, which demonstrated an incidence of 1.0 per 100,000 people from 1976 to 1990. "Our goal was to re-evaluate that Rochester Epidemiology Project data to determine if the incidence of IIH mirrors

the large rise in obesity over the past 20 years," says Dr. Chen.

The research team reviewed medical records of all patients diagnosed in Olmsted County, Minnesota, with IIH, intracranial hypertension, pseudotumor cerebri or papilledema between Jan. 1, 1990, and Dec. 31, 2014.

Patients were classified as having IIH if they met the modified Dandy criteria, which included:

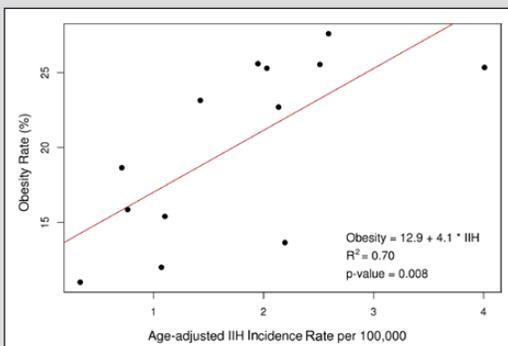
- Signs and symptoms of increased intracranial pressure
- No localizing neurological finding except cranial nerve VI palsies
- Normal neuroimaging results
- Lumbar puncture opening pressure of more than 250 mm H<sub>2</sub>O with normal cerebrospinal fluid constituents
- No other apparent cause

Patients with papilledema and borderline opening pressures (200 to 250 mm H<sub>2</sub>O) also were included in the study.

### Rates increase in parallel

The research team identified 63 new cases of IIH, yielding an overall age- and sex-adjusted annual incidence of 1.8 per 100,000 people (95 percent confidence interval, 1.3 to 2.2) between 1990 and 2014. This was double the incidence found in the original incidence study from 1976 to 1990.

In the current study period, the annual incidence increased from 1.0 per 100,000 (1990 to 2001) to 2.4 per 100,000 (2002 to 2014; P = 0.007). The incidence of IIH was 3.3 per 100,000 in women and 0.3 per 100,000 in men (P ≤ 0.001). In women ages 15 to 44



**Figure.** In this correlation between age-adjusted idiopathic intracranial hypertension (IIH) incidence and obesity rates in Minnesota ( $R^2 = 0.70$ ,  $P = 0.008$ ), each point represents two-year intervals. The obesity rates increased consistently throughout the time period of the study and corresponded to an increase in the incidence of IIH. Graph reprinted with permission from *Ophthalmology*.

### Rochester Epidemiology Project

The Rochester Epidemiology Project is a medical-records linkage system that includes information from more than 500,000 Olmsted County, Minnesota, residents spanning more than 50 years. Learn more at [Mayo.edu/research/centers-programs/robert-d-patricia-e-kern-center-science-health-care-delivery/collaborations/rochester-epidemiology-project](https://www.mayo.edu/research/centers-programs/robert-d-patricia-e-kern-center-science-health-care-delivery/collaborations/rochester-epidemiology-project).

years who are obese, the incidence was 22.0 per 100,000 compared with 6.8 per 100,000 among all women in the same age group.

The increase in incidence of IIH mirrored the increase in obesity during this time period, with a strong correlation between IIH incidence rates and obesity rates in Minnesota (Figure;  $R^2 = 0.70$ ,  $P = 0.008$ ). Data from the Centers for Disease Control and Prevention indicate that the obesity rate in Minnesota in 1990 was less than 10 percent; it increased to 28 percent by 2014. Olmsted County mirrored this trend and now has an adulthood obesity of 27 percent.

“Our study shows that the incidence rates of IIH and obesity have risen in parallel since 1990,” says Dr. Chen. “There is no sign of obesity rates declining, so recognizing and treating patients with IIH promptly are of increasing importance.” Study results were published in *Ophthalmology* in 2017.

### For more information

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## Risk of Serious Complications Increases for Older Adult Patients Treated With Dacryocystorhinostomy for Acquired Nasolacrimal Duct Obstruction



Elizabeth A. Bradley, M.D.

The incidence of acquired nasolacrimal duct obstruction (NLDO) increases with age. Dacryocystorhinostomy, the definitive treatment for NLDO, has a high success rate with a low complication rate overall, but surgical outcomes have not been reported specifically for an older adult population.

“Multiple factors confer an increased surgical risk on older patients, who as a group receive the highest number of surgical procedures. We wondered whether older patients treated for NLDO may be at increased risk of intraoperative and postoperative complications,” says Elizabeth A. Bradley, M.D., with Ophthalmology at Mayo Clinic’s campus in Rochester, Minnesota. “There is a need for data to assess outcomes of surgery in this age group.”

Dr. Bradley and a research team examined surgical outcomes and complication rates of dacryocystorhinostomy in a retrospective study of patients age 80 and older who were treated with external dacryocystorhinostomy at Mayo Clinic between Jan. 1, 1990, and Dec. 31, 2010. The team then compared outcomes with a matched control group of patients ages 40 to 79 who were treated with external dacryocystorhinostomy by the same surgeon within 12 months of their paired older adult patient.

Data abstracted from patient medical records included symptomatic relief and com-

plications such as tube protrusion, infection, persistent bleeding and return to operating room. The primary endpoint was complete or substantial resolution of presenting symptoms at the time of last follow-up. Secondary endpoints included anatomic patency, adverse event rate and return to operating room within one month of surgery.

In the older adult group, 32 patients underwent 42 dacryocystorhinostomies; in the control group, 63 younger patients underwent 73 dacryocystorhinostomies. Comparative results include the following:

- Resolution of symptom rate at last follow-up was 64 percent in the older adult group versus 86 percent in the younger group ( $P = 0.02$ ).
- Although there was no difference between groups with respect to common postoperative complications, there was a higher rate of serious complications in the older adult group (five events versus one event;  $P = 0.01$ ).
- There was no difference between groups regarding need for additional eyelid surgery ( $P = 0.30$ ).

“Although most older patients experienced symptom resolution after dacryocystorhinostomy, the rate of symptom resolution was significantly lower than that of younger

patients,” says Dr. Bradley. “The risk of routine complications was similar between groups, but the risk of serious complications was higher in the older group.

“Over the last half-century, the number of people older than 65 years has tripled worldwide. The population comprising those 85 and older is projected to more than triple by 2060. Consideration of individual patient symptoms in the context of medical comorbidities, combined with discussion of the potential benefits

and risks of surgical intervention, may allow more effective counseling of older patients who are considering dacryocystorhinostomy surgery.” Study results were published in *Ophthalmology* in 2017.

#### For more information

Tooley AA, et al. Dacryocystorhinostomy for acquired nasolacrimal duct stenosis in the elderly ( $\geq 80$  years of age). *Ophthalmology*. 2017;124:263.

## Optical Coherence Tomography Shows Promise for the Noninvasive Detection of Elevated Intracranial Pressure

Jordan W. Swanson, M.D., and others from the University of Pennsylvania published research evaluating the use of optical coherence tomography (OCT) to detect elevated intracranial pressure in children in the April 2017 issue of *JAMA Ophthalmology*. In the same issue, Michael C. Brodsky, M.D., *Ophthalmology*, John J. Chen, M.D., Ph.D., *Ophthalmology*, and Nicholas M. Wetjen, M.D., a pediatric neurosurgeon at Mayo Clinic’s campus in Rochester, Minnesota, discussed the study findings.

“Lumbar puncture is the usual confirmatory procedure for the diagnosis of intracranial hypertension, but lumbar cerebrospinal fluid pressure does not always reflect the intracranial pressure (ICP), especially in children,” says Dr. Brodsky. “As a result, direct monitoring is the current gold standard for ascertainment of ICP. Direct monitoring is more invasive than lumbar puncture and requires general anesthesia and hospital admission to monitor ICP over a period of days. It also carries a low risk of central nervous system infection or injury.

“The OCT evaluation of the 3-D disk parameters to detect intracranial hypertension proposed by Dr. Swanson and others is novel. Prior OCT studies have typically reported the peripapillary retinal nerve fiber layer (RNFL) thickness. In contrast, these investigators manually measured various parameters of the disk itself, including the maximum RNFL, maximal retinal thickness and maximal anterior retinal projection of the disk.

“OCT has shown high sensitivity for identifying subtle neuroanatomical changes within and around the optic disk that correlate with the presence of papilledema. It is noninvasive and can often be performed without sedation or hospital admission.”

#### Children with craniosynostosis

Dr. Chen comments: “The 3-D OCT disk parameters in this study yielded a sensitivity of 89 percent and specificity of 62 percent in detecting elevated ICP in children with craniosynostosis. In contrast, the standard automated optic nerve head parameters, including the average peripapillary RNFL thickness, did not differentiate patients with elevated ICP and those without elevated ICP, which suggests the 3-D parameters of the disk may be more sensitive than the standard peripapillary RNFL thickness measurements in detecting raised ICP.

“Pending clarification of the neurocognitive effects of intracranial hypertension and the true physiological threshold for ICP elevation, it remains unclear how this sensitive technology will affect the decision to proceed with cranial vault decompression for craniosynostosis or shunting for hydrocephalus.

“It is important to note that direct intracranial pressure monitoring is not routine in children with uncomplicated craniosynostosis or hydrocephalus. Here at Mayo Clinic, we do not typically monitor children with single suture craniosynostosis less than 2 years of age unless there is a clinical suspicion that they have developmental delays, irritability or headaches related to decreased intracranial volume. Without visible papilledema, there is no threat to the vision in these children.

“However, we tend to monitor children with syndromic craniosynostosis because they have a higher risk of decreased intracranial volume, hydrocephalus and poor venous outflow, which puts them at higher risk of intracranial hypertension. This complex form of craniosynostosis can be independently associated with hydrocephalus (ventriculomegaly), and may portend a different clinical outcome than in those



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## Contact Us

Mayo Clinic welcomes inquiries and referrals, and a request to a specific physician is not required to refer a patient.

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800-533-1564

## Resources

[MayoClinic.org/medicalprofs](http://MayoClinic.org/medicalprofs)

Clinical trials, CME, Grand Rounds,  
scientific videos and online referrals

without hydrocephalus. Three-dimensional OCT disk measurements could play a large role in these patients."

### Study raises new questions

Dr. Chen notes: "The complexity of OCT data analysis may limit the general applicability of this study. These OCT measurements require the ability to accurately calibrate, demarcate, quantitate and interpret subtle neuroanatomic aberrations, which is a diagnostic skill set likely to be inaccessible to many practicing ophthalmologists. In addition, 3-D OCT disk parameters may have less specificity than the standard OCT peripapillary RNFL thicknesses because congenital anatomic variations in the disk will likely have a larger effect on the variability of the disk parameters. Ultimately, we will need automated ways of measuring the 3-D OCT disk parameters and prospective evaluations of these parameters to see how they vary with treatment of intracranial hypertension."

Dr. Brodsky concludes: "This study represents an important step forward in providing sensitive noninvasive detection of elevated ICP in children who are symptomatic. OCT could change current neurosurgical practice by sparing these children the stress and risks of invasive ICP monitoring, and perhaps positioning the ophthalmologist to play a more determinative role in ascertaining the need for neurosurgical intervention."

### For more information

Swanson JW, et al. Evaluation of optical coherence tomography to detect elevated intracranial pressure in children. *JAMA Ophthalmology*. 2017;135:320.

Brodsky MC, et al. Optical coherence tomography for the noninvasive detection of elevated intracranial pressure: A new role for the ophthalmologist? *JAMA Ophthalmology*. 2017;135:329.

### Pediatric Neuro-Ophthalmology, Third Edition, Available

Neuro-ophthalmology has long been a focused area of specialty for the diagnosis and treatment of such diseases. Recently, the field of pediatric neuro-ophthalmology has burgeoned. Last September, the European Paediatric Ophthalmological Society dedicated its annual meeting in Zurich, Switzerland, to pediatric neuro-ophthalmology.

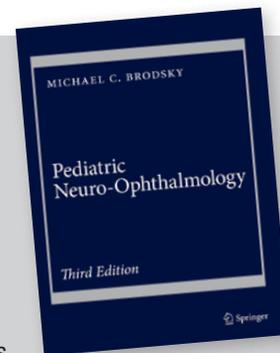
In response to the demand for an encyclopedic reference, Michael C. Brodsky, M.D., professor of ophthalmology and neurology and Knights Templar Eye Foundation, Inc. Professor of Ophthalmology Research at Mayo Clinic in Rochester, Minnesota, has recently published the third edition of his definitive textbook titled *Pediatric Neuro-Ophthalmology*. Published by Springer-Verlag New York, the textbook contains 823 pages that detail the current diagnostic management and treatment of neuro-ophthalmological diseases in children.

According to Dr. Brodsky: "Children have often unique neuro-ophthalmological presentations that do not conform to our standard diagnostic paradigms in adults. Consequently, they may be subjected to unnecessary diagnostic studies that delay the definitive diagnosis and management of these vision-threatening disorders. It is my hope that this third and

final edition will provide a narrative to facilitate the clinical diagnosis and direct proper treatment of these disorders.

"Replete with color photographs, magnetic resonance images and tables, this book took approximately four years of concentrated effort to compile. Funding for the research time was generously provided in part by an endowed chair from the Knights Templar Eye Foundation at the inception of this project. Ophthalmology at Mayo Clinic also provided research time to permit this project to reach fruition.

"The generous institutional support from Mayo and philanthropic support from the Knights Templar Eye Foundation enabled me to complete this work while maintaining a busy clinical practice. Working at Mayo Clinic also provided me with a wealth of clinical material and with excellent neurological subspecialists to imbue the book with expertise." *Pediatric Neuro-Ophthalmology, Third Edition*, can be purchased at [www.springer.com](http://www.springer.com).



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